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January, 1960

Welding Engineer

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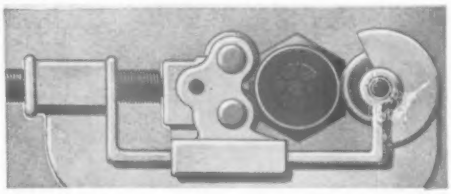
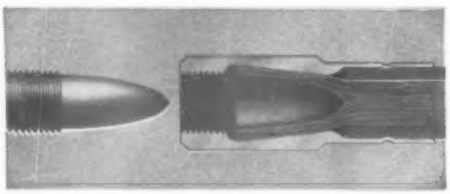
Copper alloy lower jaw terminates in a point, silver-plated for greatest conductivity. When nut is tightened, cable strands are equally disposed around this point, *Sealed Tight*.

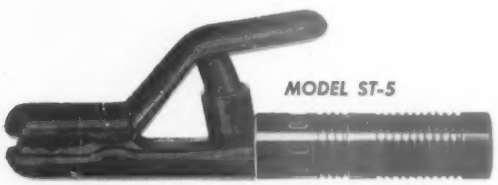
The nut extends backward, forming a ferrule around the cable jacket. This *Sealed Tight Connection Nut* is made in sizes to fit cables No. 1, 1/0, 2/0, and 3/0.



For a *truly permanent nut-to-cable connection*, the ferrule of the nut is crimped around the cable jacket, using Jackson's inexpensive, fast-acting crimping tool.



Detachable Stinger feature enables the operator to detach the "stinger end" by unscrewing it from the connection nut. The cable strands stay in place inside the nut.



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HOBART'S new versatile automatic welder
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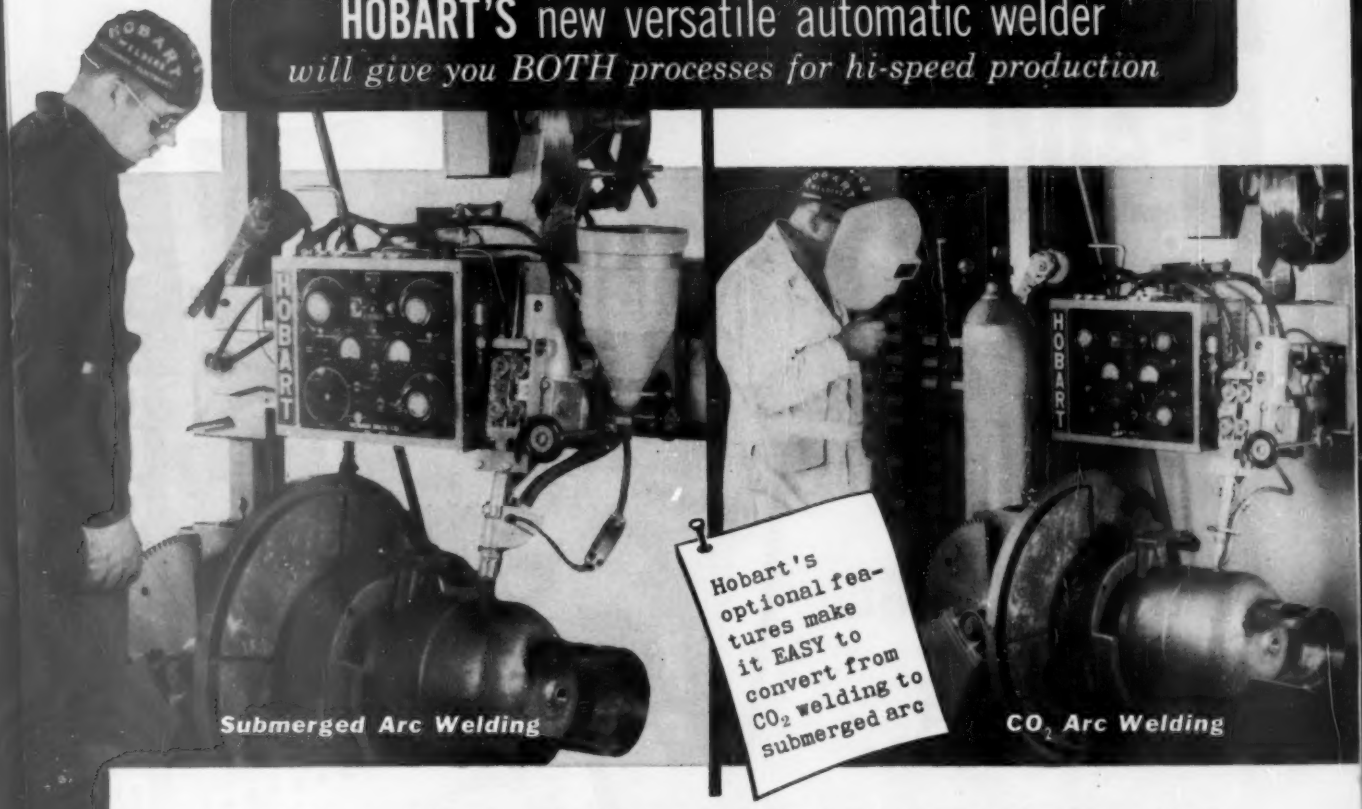
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Submerged Arc Welding
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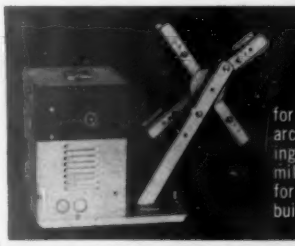

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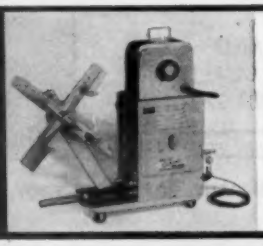

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"Manufacturers of the World's Most Complete Line of Arc Welding Equipment"

VOL. 45 — No. 1

Welding Engineer

The magazine of joining and severing of materials

This is welding: January, 1960

The Soaring Sixties 23

Starting a new year and a new decade is an ideal time for some self-analysis, affording a chance to bring together welding's past, present and future. The editors feel the next 10 years will see a tremendous growth in the welding industry—and industry leaders agree. What will The Soaring Sixties mean to you?

Fundamentals of brittle fracture 28

In this definitive article on an old acquaintance of engineers and scientists, author **Bela Ronay** details and discusses the causes and characteristics of fatigue failure, as well as listing some safeguards against its occurrence.

★ (For a reprint of this article, circle number 249.)

Multiple-power sources invade automotive field 30

Multiple-operator welding power sources have established a beach-head in the automotive world. Editor **F. T. Tancula** reports on the installation and use of three such units at the Kenosha, Wis., plant of American Motors Corp.

Welding cuts costs, increases rigidity on redesigned lathe 32

The key to lower manufacturing costs is welding. **Ernst Duesing** realized this fact and his resulting paper on a lathe redesigned for welding won him the $10,000 first award in the Lincoln Foundation's annual machine design award program.

How to simplify machine bracket design 36

Some design engineers are still strangers to welding's advantages of greater strength, less weight and lower costs. The design ideas for machine brackets in this article show how these advantages were obtained easily and quickly with a little imagination—and welding.

★ (For a reprint of this article, circle number 250.)

Flame-cutting, arc welding build precision towers 48

Television towers over 1,000 ft high are the results of one company's use of electronically-guided flame-cutting and arc welding. Editor **F. T. Tancula** reports on the fabrication and assembly of these "giants of the airwaves."

Also in this issue:

Welded pipe system for rink 40
Argonne lab studying metal embrittlement 41
Brazing cuts valve housing cost 40% 42
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Arc-air slices costs of locomotive repairs 53
Powder cutting torch tumbles the flood walls 60
Soldering cuts production time, costs 62

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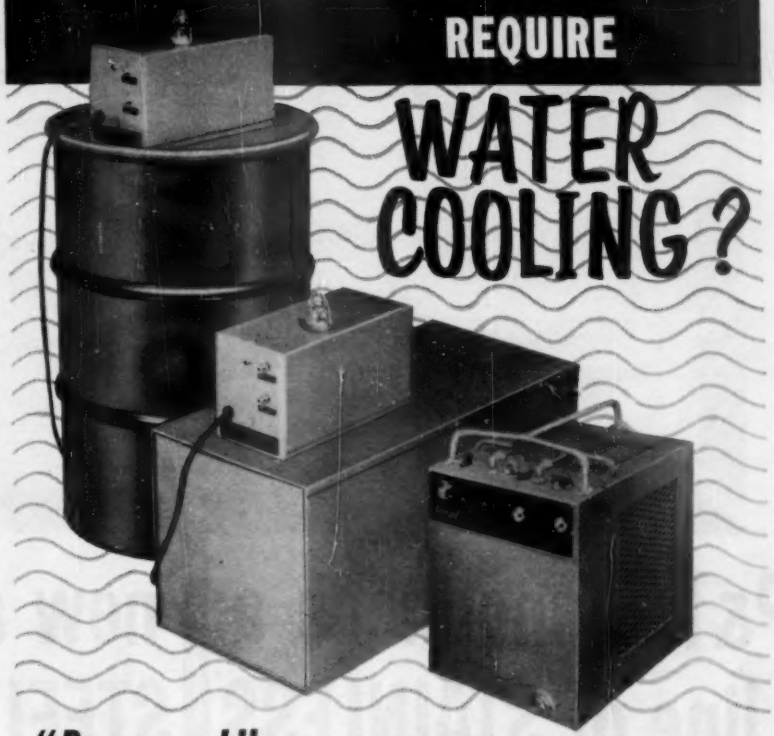
DOES YOUR WELDING EQUIPMENT REQUIRE

WATER COOLING?



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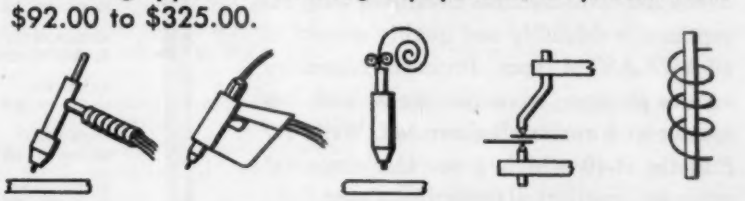

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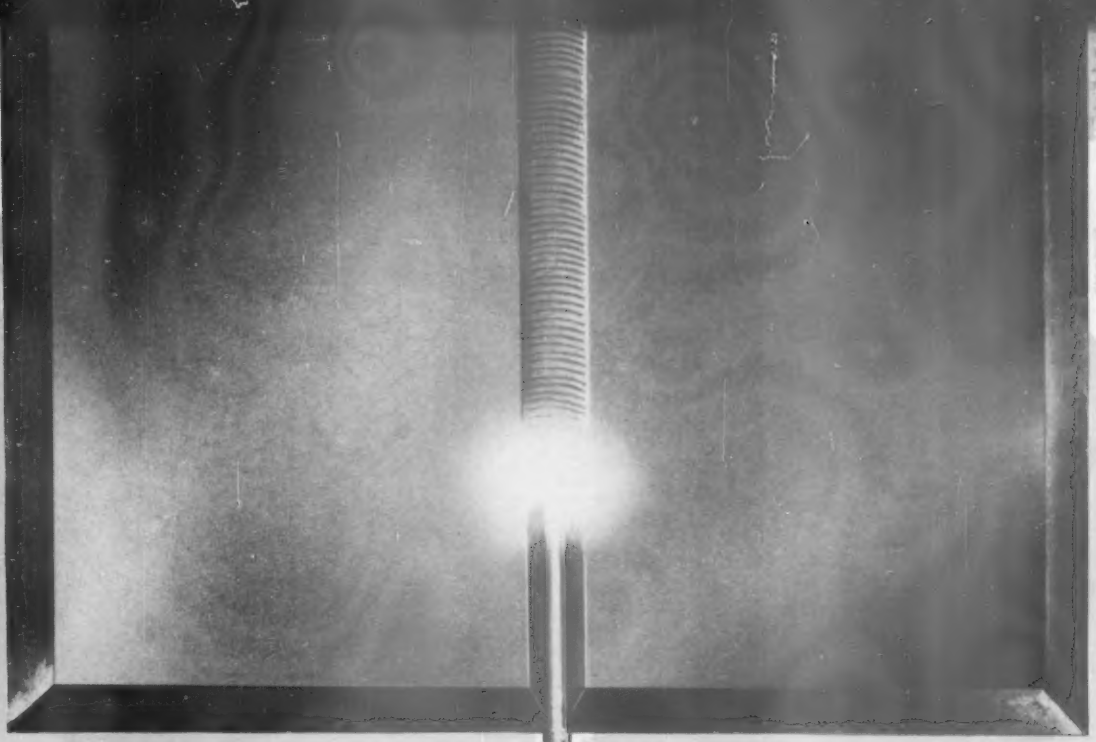

P&H announces a new and complete line of STAINLESS STEEL ELECTRODES

In addition to a wider choice, Harnischfeger offers you stainless steel electrodes with exceptional weldability and quality control in all AWS-ASTM types. Improved chemistry assures stronger, smoother beads, with less spatter and easier slag removal. Write for Bulletin R-49 which gives the chemical range and mechanical properties of each P&H stainless steel electrode listed here. And tell us about any special requirements you may have. We'll be happy to work with you.

P&H TYPE	AWS CLASS
Harstain 308	E-308-15
Harstain "A" 308	E308-16
Harstain 308 ELC	E308 ELC-15
Harstain "A" 308 ELC	E308 ELC-16
Harstain 309	E309-15
Harstain "A" 309	E309-16
Harstain 309 Cb	E309 Cb-15
Harstain "A" 309 Cb	E309-Cb-16
Harstain 309 Mo	E309 MO-15
Harstain "A" 309 Mo	E309 MO-16
Harstain 310	E310-15
Harstain "A" 310	E310-16
Harstain 310 Cb	E310 Cb-15
Harstain "A" 310 Cb	E310 Cb-16
Harstain 310 Mo	E310 Mo-15
Harstain "A" 310 Mo	E310 Mo-16
Harstain 312	E312-15
Harstain "A" 312	E312-16

P&H TYPE	AWS CLASS
Harstain 316	E316-15
Harstain "A" 316	E316-16
Harstain 316 ELC	E316 ELC-15
Harstain "A" 316 ELC	E316 ELC-16
Harstain 317	E317-15
Harstain "A" 317	E317-16
Harstain 318	E318-15
Harstain "A" 318	E318-16
Harstain 330	E330-15
Harstain "A" 330	E330-16
Harstain 347	E347-15
Harstain "A" 347	E347-16
Harstain 349	E349-15
Harstain "A" 349	E349-16
Harchrome 502	E502-15
Harchrome 505	AISI 505
Harchrome 410	E410-15
Harchrome 430	E430-15

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WELDERS · ELECTRODES · POSITIONERS

NEWS

AWMA not overlapping, president says

The newly-formed Automatic Welding Machinery Association does not overlap the function of any other groups in the field, according to E. W. Hollis, AWMA president.

Hollis stated the group's purposes are to "draw technical and management personnel of automatic welding machinery manufacturers together to provide better user understanding of the equipment, and also to create uniform nomenclature, engineering standards and methods of rating.

"Certainly there can be little justification for this association if it is a duplication of other established groups, but this is hardly true," he indicated. Hollis pointed out that fusion welding has become an integral part of more and more production operations, and that making welding more automatic and repetitive is essential from the cost and quality standpoint.

"As the need for automatic welding has grown, a number of machine builders have taken the lead in designing and building welding machine tools," he said. "As is the case in any new field, however, there are few milestones for guidance, and little coordination of product."

Mills of Bastian-Blessing is dead at 72

The Bastian-Blessing Co., Chicago, lost one of its top executives with the death early in December of Ellsworth L. Mills, 72, vice-president and director. Mr. Ellsworth, known as "The Colonel", had a varied career. Born in Denver in 1887, he was educated in New York state and in the years before World War I was a consulting engineer to the New York City subway commission.

Subsequently he served as sales manager for the Apparatus and Railroad sales divisions of the Air Reduction Co., New York. He was with Bastian-Blessing since 1920.

A leader in and often called the father of the liquified-petroleum gas industry, Mr. Mills was responsible for many advancements in equipment design and distribution. He was a founding director of the American Welding Society and past president of the International Acetylene Association, and the Gas Products Association.

Surviving Mr. Mills are his widow, three daughters, two sons, and a brother.

Most space sold for AWS show

Eighty-five percent of available space for the American Welding Society's annual exposition, has already been sold. The show, to be held at the Great Western Exhibit Center in Los Angeles on April 26-28, is expected to draw executives, engineers, and scientists from all parts of the world.

National Secretary Fred L. Plummer stated that the show may require 50,000 sq ft of space to house exhibits. A technical meeting will be held concurrently at the Biltmore Hotel.

General office building of Ransome Co. in Scotch Plains, N. J.

Big Three buys Worthington positioner business

The re-emergence of the 110-year-old name, Ransome, was recently announced by Paul Galton, general manager of the new Ransome Co. Ransome has purchased the complete welding positioner business of Worthington and will now handle all phases of this business. Headquarters are in Scotch Plains, N. J.

Manufacturing operations are being continued at the Worthington Plainfield division while a new Ransome facility is under construction. The new management will include many seasoned old-timers as well as a sprinkling of new young talent.

The original Ransome Machinery Co. was founded in 1850, and later introduced the first commercial welding positioner. The new Ransome Co. is now a wholly-owned division of the Big Three Welding Equipment Co., Houston, for 40 years a manufacturer and distributor of welding equipment and gases.

Galton brings with him 19 years of experience in the welding industry. He was formerly general sales manager of the Worthington Plainfield Division. The new company states it aims to continue the manufacture of its standard line of welding positioners, and at the same time enter fully into the field of machine tools for automation welding.

400 firms to exhibit at maintenance show

Four hundred companies will exhibit to an expected 20,000 visitors from some 30 countries at the Plant Maintenance and Engineering show to be held at Convention Hall, Philadelphia, from Jan. 25-28.

The exhibit, called the largest in the 11-year history of the exposition, will contain some 10,000 different products. Representatives from thousands of companies are expected to attend, seeking ways to cut their respective maintenance bills.

Accompanying the show will be a plant maintenance and engineering conference. Seventy-one speakers will address 43 sessions. Drawn from 52 companies in 20 basic industries, these men will represent a broad industrial and geographical cross section of the country.

Following the show, 200 top executives will gather in ten executive study groups to discuss major problems of maintenance in small, informal sessions.

ELEVEN cu yd can be carried in this welded aluminum dump body made by Euclid Steel Fabricating Co., Inc. Huntington Park, Calif. The unit, 7 x 14 ft, weighs only 1,400 lb, permitting a payload increase of 1,500 lb compared to the load of a steel unit of the same size. Kaiser 5083 aluminum plate was welded with 5356 wire.

Welding symbols approved by ASA

The latest revision of the American Standard Graphical Symbols for Welding has been approved by the American Standards Association and published by the American Society of Mechanical Engineers.

Developed by the American Welding Society, the symbols were submitted to and approved by ASA Sectional Committee on graphical symbols and designations.

Designated Y32.2-1959, the new American Standard provides the means of placing complete welding information on drawings.

Western welding show set for October

Advance announcement of the third AWS Western Welding show has been made by the society. Set for Oct. 13, 14, and 15 at the Santa Clara County Fair Grounds, San Jose, Calif., the show will take place on a 48,000 sq ft modern facility with ample power available. In order to reach a wider audience, subsequent shows may move up and down the west coast.

Conjointly with the show will be a welding technical conference. Papers on timely welding subjects will be presented by authorities in the welding field.

New welding course at Stevens Institute

A new course in welding processes will be offered by the Industries Training school at Stevens Institute of Technology during the 1960 spring semester, it was announced by ITS director L. Edwin Backer.

The course is designed for men who want to upgrade their positions in the appliance, electronics, metal fabrication, shipbuilding, and related industries. Included will be lectures on brazing, resistance welding, manual, semiautomatic, and automatic arc welding; metal and carbon electrodes, and a detailed study of the physics of arc welding. Demonstrations will supplement the lectures, and students will be encouraged to discuss practical problems they have encountered while working in industry.

COMING EVENTS

JAN. 18-20: Compressed Gas Association, Inc. 47th annual meeting, Waldorf-Astoria Hotel, New York City.

JAN. 20, 1960: Metallurgical Society of AIME, Flat Rolled Products Conference, Del Prado Hotel, Chicago.

JAN. 25-28, 1960: Plaint Maintenance and Engineering Show, Convention Hall, Philadelphia.

FEB. 3-4, 1960: Midwest Welding Conference, Illinois Tech Chemistry Building, Chicago.

FEB. 16-18: First National Symposium on Nondestructive Testing of Aircraft and Missile Components, sponsored by Southwest Section of the Society for Nondestructive Testing, Inc., and Southwest Research Institute, Hilton Hotel, San Antonio.

APRIL 4-7, 1960: 1960 Atomic Exposition, New York Coliseum, New York City.

APRIL 25-29, 1960: 41st Annual Convention, AWS, The Biltmore Hotel, Los Angeles.

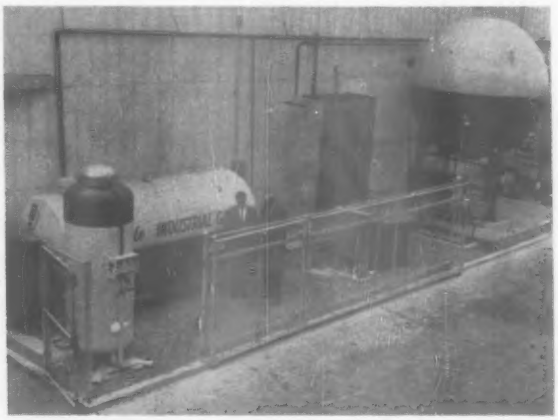
APRIL 26-28, 1960: AWS Exposition, Great Western Exhibit Center, Los Angeles.

MAY 5-7, 1960: NWSA 16th Annual National Convention, Palmer House, Chicago.

Lecture series completed by Chicago AWS

The second annual educational lecture series in welding, sponsored by the Educational Activities Committee of the AWS Chicago section, was recently completed. Held in the Chicago Bridge & Iron Co.'s "Dome" meeting hall, the series had an enrollment of 160 students, and attendance was nearly perfect, according to R. E. Oller, chairman of the committee.

ON display at recent New England Welding Conference at West Hartford, Conn., was over $250,000 worth of the latest welding and allied equipment. Here, Lieutenant Governor John N. Dempsey of Connecticut is oxygen cutting a chain that opened the show. Looking on, from left, are AWS members G. W. Kirkley, Jr., AWS vice-president R. D. Thomas Jr., president C. I. MacGuffie, Dempsey, S. A. Zane, national secretary F. L. Pummer, and W. A. Dunckle. 2,400 persons attended the conference



RECENTLY installed compact liquid gas storage and distribution system. Gardy Quinn (left) of Linde Co. and Jack Reynolds of Solar Aircraft Co. of San Diego check liquid argon sphere (far right) with a 310,000 cu ft capacity, horizontal liquid nitrogen tank (center), 150,000 cu ft, and liquid oxygen tank (foreground), 25,000 cu ft. Installed by Linde, the units automatically convert the liquids to gaseous form and distribute the gases throughout Solar's facilities.

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quick, easy, economical with P&H welders and electrodes

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P&H hardsurfacing electrodes can be used to prevent wear and to prolong the service life on valuable equipment. What's more, hardsurfaced parts will in most cases outlast the original parts by two to twenty-five times!

Investigate both. Write for Bulletin W-158 which describes the welders — and Bulletin R-27 for information on the hardsurfacing electrodes.

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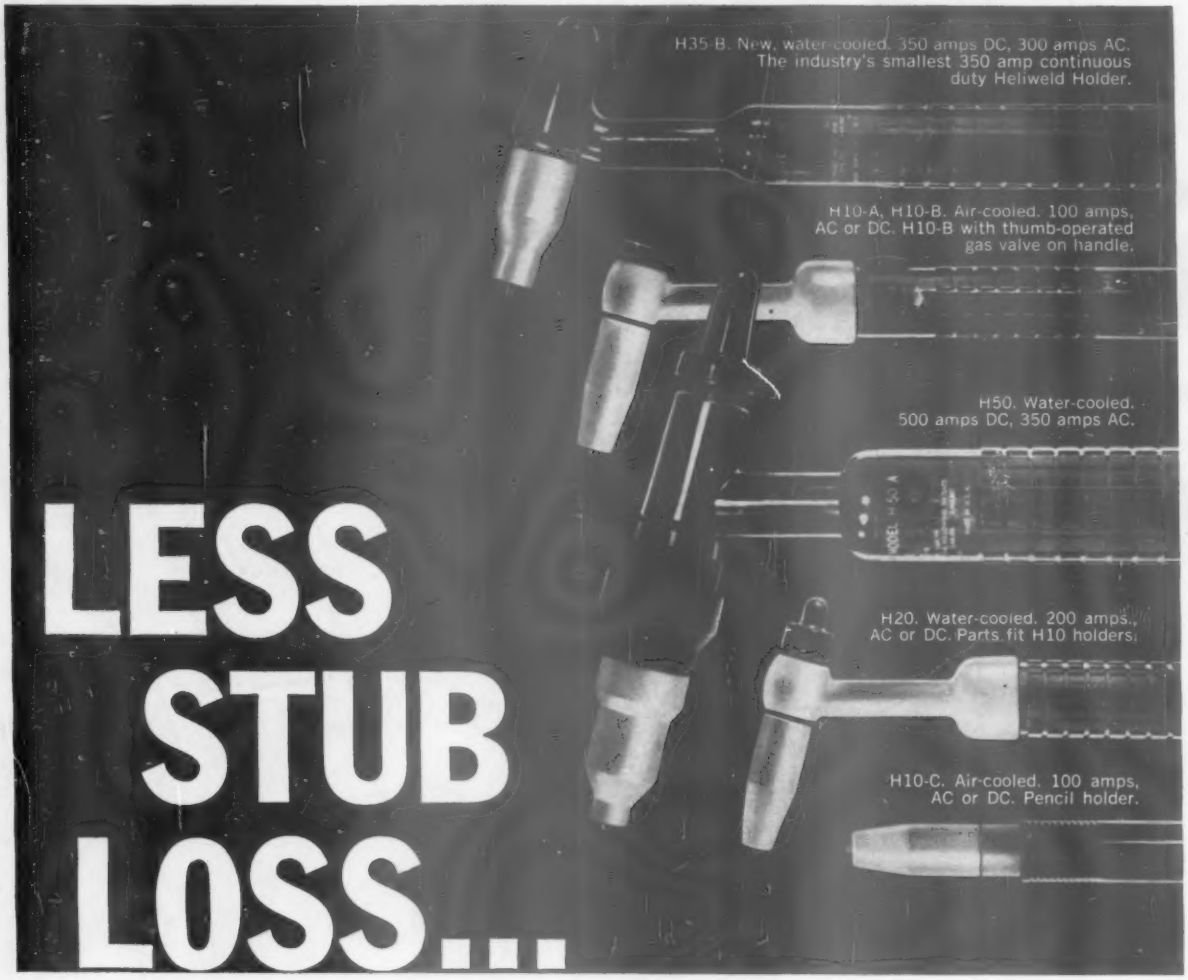
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H50. Water-cooled. 500 amps DC, 350 amps AC.
H20. Water-cooled. 200 amps., AC or DC. Parts fit H10 holders.
H10-C. Air-cooled. 100 amps, AC or DC. Pencil holder.
LESS STUB LOSS...

one of 4 big reasons why you'll go for these AIRCO Heliweld Holders

1. LESS ELECTRODE LOSS—You can reduce stub losses as much as 50% when Heliwelding thin gauge aluminum, stainless, copper base alloys, zirconium, magnesium or killed steel . . . if you use an Airco manual Heliweld Holder. You throw away less than one inch of stub (not 3 inches).

You make other savings too. You use alumina nozzles, for example, which have high resistance to heat and impact shock. You save on the gas, because you need less for adequate coverage.

2. A HOLDER FOR EVERY JOB—The complete range of Airco Heliweld Holders, rated from 100 to 500 amps, assures proper holder selection for your job.

3. FULL CAPACITY RATINGS—The five Airco Heliweld Holders provide for the industry's widest range of current selection in a single integrated line. Holders are rated at full capacity for continuous duty cycle for argon or helium, AC or DC. Non-turbulent gas flow and high current density combine to give you welds of X-ray quality.

4. EASIER HANDLING—For easier handling try the new H35-B. You'll find it the standout holder for work in tight corners. All of the holders feature Airco's non-slip corncob handle. Weights are a mere 4 ozs. to 11 ozs.

Heliweld Economy Packs are available from your Authorized Airco Dealer. He's listed in the Yellow Pages under "Welding Equipment and Supplies".

AIRCO®

AIR REDUCTION SALES COMPANY

A division of Air Reduction Company, Incorporated

150 East 42nd Street, New York 17, N.Y.

Offices and authorized dealers in most principal cities

On the west coast—
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Internationally—
Airco Company International

In Cuba—
Cuban Air Products Corporation

In Canada—
Air Reduction Canada Limited

All divisions or subsidiaries of Air Reduction Company, Inc.

WELDING ENGINEER

Your January, 1960

Weld World

As WE went to press, these were the industry's latest developments:

. . Lukens Steel Co., Coatesville, Pa., was assured a happy 150th anniversary when the union unanimously approved interim agreement reached in sessions between company and union negotiators. Thus steel will flow without interruption during its sesquicentennial year. Lukens was founded in 1810.

. . Robinson Technical Products, Inc., Teterboro, N. J., which only several months ago purchased High Vacuum Equipment Corp., Hingham, Mass., has merged with Kensico Tube Co., Inc., Mt. Kisco, N. Y., subject to stockholder approval. Kensico will become a division of Robinson and will continue under same management, headed by President Thomas Nast.

. . Diversification plans have been announced by Smith Welding Equipment Corp., Minneapolis, but so far no news (at least, for the record) on the direction this expansion is to take.

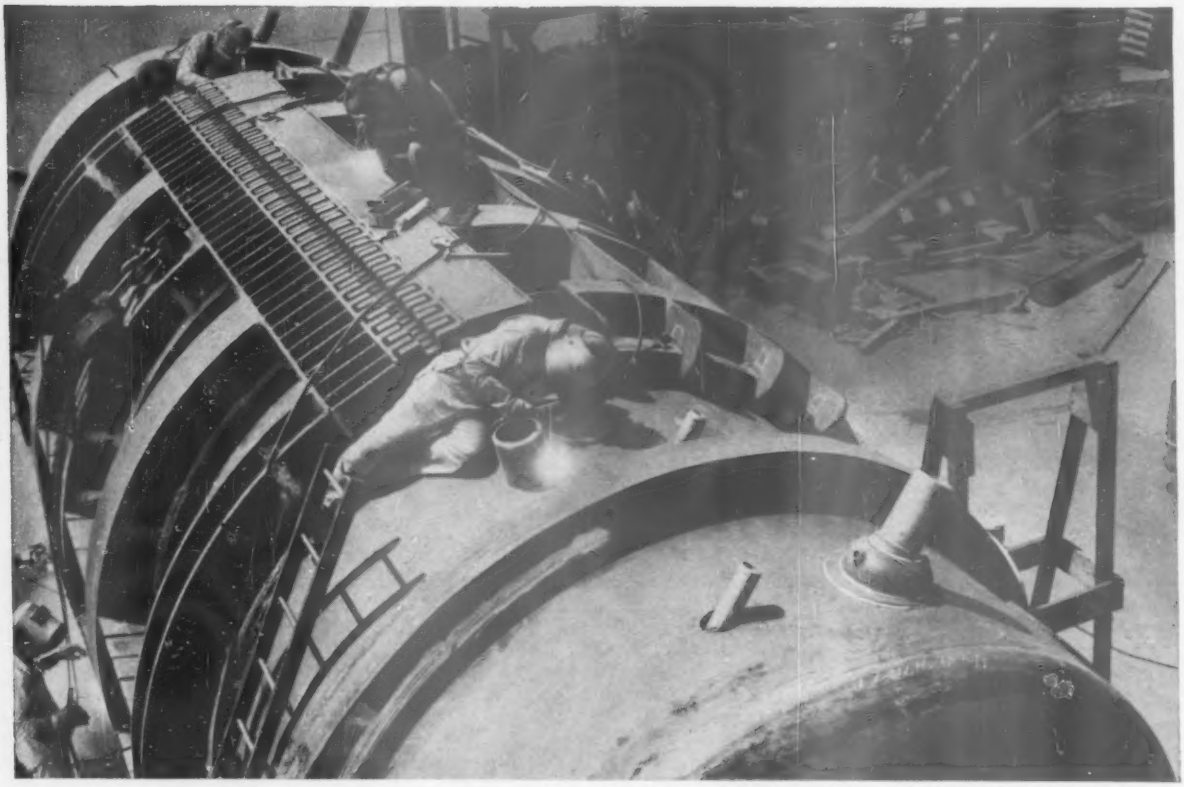
. . A "remarkable" new family of high strength (250,000-plus psi yield) nickel alloy steels has been invented in the research laboratories of The International Nickel Co., Inc. Identified as 25% nickel steels. they achieve unique properties by simply air cooling from heat-treating temperatures. Alloys are weldable in hardened condition without preheat. But it is the fact that strength properties are obtained without liquid quenching that will enable intricate parts to be fabricated to close tolerances while steel is in soft annealed condition and permit them to be hardened to high-strength levels without appreciable distortion.

. . Copper Range Co. has acquired a substantial interest in The Alloyd Corp., the Watertown, Mass., firm organized by a group of M.I.T. scientists. One of the projects in which Alloyd is involved is joining and melting by electron-beam methods.

. . The next 10 years promise to be good ones--but the prosperity most experts predict will not come without effort. For a look into the future, see the special section on "The Soaring Sixties" in this issue.

. . On the plasma arc welding front: Temperatures of 90,000 F are said to be generated by new process under development by a West Coast firm.

. . Sales of resistance welding equipment continue to improve. Shipments reached (and passed) the $2,000,000 mark for the eighth consecutive month.



Inco-Weld "A" Electrode joins high-strength low-alloy steel and 304 stainless, in 45 ft by 12 ft diameter pressure chamber. Fabricated by O. G. Kelley and Co., Boston, Mass.

Inco-Weld "A" joins most dissimilar alloys in nuclear applications, too

The 4 weldors above are all using Inco-Weld* "A" Electrode. They're welding high-strength low-alloy steel *and* 304 stainless on a 160-ton nuclear components testing chamber.

Two other popular electrodes failed on test welds for this job . . . weld metal cracked from differing thermal expansion rates between the dissimilar metals joined.

Inco-Weld "A" Electrode solved this problem . . . produced X-ray quality weld throughout; with corrosion resistance equal to parent metal.

Better than 97% of *all* weldable dissimilar alloys can be joined with both Inco-Weld "A" Electrode and Inco-Weld "A" Wire. You don't need any special equipment or training to get sound, strong, corrosion-resisting welds.

Useful new booklet "Now You Can Weld Dissimilar Alloys Quickly and Easily" includes actual cases of problem welds solved; costs reduced; with Inco-Weld "A" Electrode and Wire.

*Inco trademark

HUNTINGTON ALLOY PRODUCTS DIVISION
The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

MLG or TIG-Weld dissimilar alloy combinations with Inco-Weld "A" Wire

You get all the advantages of Inco-Weld "A" Electrode plus an age-hardenable deposit. Available in spools and cut lengths.

INCO WELDING PRODUCTS
TRADE MARK
electrodes • wires • fluxes

A new twist in the tale of the Phoenix Bird...

WORTHINGTON

as told by RANSOME

Like the phoenix bird, Ransome is born anew!

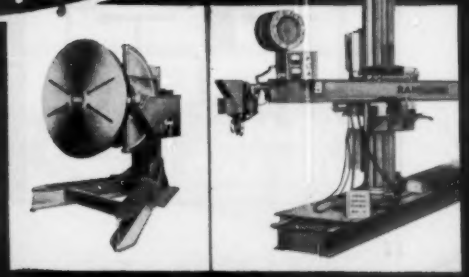
Huddled around a campfire somewhere in the Arabian deserts, they often tell the legendary tale of the phoenix bird, a mythical creature destined to flourish a number of years, to fade away, and then to emerge again in greater glory.

In the welding industry, they're telling the remarkable story of the Ransome Machinery Company. Born 110 years ago, Ransome established itself as a prime supplier of fine machinery. In 1932, Ransome pioneered positioning equipment for the welding industry. Then in 1943, Ransome was merged with the Worthington Corp., and progressed as a subsidiary of that company.

Today, having bought Worthington's positioning equipment business, the Ransome name shines anew. Organized once again as an independent entity to be known as Ransome Company, Ransome is infused with young bloods eager to prove their mettle under the veteran top management that directed the division while part of Worthington.

The **new** Ransome Company pledges to uphold its heritage of fine craftsmanship and service and re-dedicates itself to the design and manufacture of the most advanced machine tools for automation welding.

Ransome combines the best of the old with the newest. Call on the new Ransome Company for creative imagination in filling your automatic welding needs.



Ransome Company

Scotch Plains, New Jersey

RANSOME THE PIONEER IN POSITIONING FOR WELDING

ATLAS... FIRST AGAIN!

NOW YOU GET 18% MORE CHIPPING EFFICIENCY ALONG WITH OTHER BIG ATLAS ADVANTAGES!

Everybody benefits from an improvement like new "WIDE BLADE," the welder, the owner of the business and even Atlas because new names will be added to the thousands already on our customer list.

Why is Atlas always first with chipping tool innovations? It's simple as this—We are specialists. This is our principal business, not a side line. We are constantly looking for ways to improve weld cleaning techniques—to speed the job and do it better at less cost. Every member of the famous Atlas Line now has "WIDE BLADE," too!

Ask your welding supply dealer to show them to you.

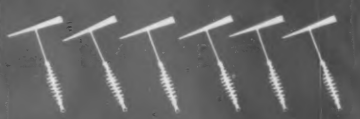
33 MODELS THEY ALL HAVE WIDE BLADES

WIDE BLADE

HERE'S WHAT 18% MORE BLADE WIDTH MEANS TO YOU

This much more weld cleaned in the same amount of time with the same amount of effort.

Sharpen less often. Tools last longer and non-productive time saved.



It's like getting a free tool every time you buy five, because the new wide blades wear longer.

ATLAS WELDING ACCESSORIES INCORPORATED
707 E. LEWISTON
FERNDALE 20, MICH.

Letters . . .

"Benefits" editorial

Sir: *Minneapolis*

Thank you for your editorial entitled "Free(dom's) benefits" in the November issue. In my estimation, it is an outstanding article and one that deserves a reprint.

You are to be commended for bringing to your readers an article to renew their thinking about our wonderful country, and how thankful we should all be for having a part in its welfare.

John R. Cain
District Sales Manager
Smith Welding Equipment Corp.

Tallest boom?

Sir: *Lorain, Ohio*

Our attention has been called to the article on page 69 of the November *Welding Engineer* . . . we object to the statement:

"But the 140-ft long boom and jib—tallest in North America and possibly the world—is now out on jobs around the Ontario environs."

We do not know the source of your information, but apparently this was not obtained from the manufacturers of power cranes and shovels, as many of us in the industry build booms far in excess of 140 ft in length. As far as we are concerned, I am attaching a copy of

Taller boom . . . of steel

our capacity chart covering 35-ton Moto-Crane MC-530W with D8-W boom. Notice that it permits carrying 170 ft of boom including the tip. The basic boom itself is 130 ft, in contrast to the 110 ft you list in your article.

. . . also . . . the Lorain-85A with long-range D-3 boom has permissible basic boom of 200 ft and overall with tip expansion of 240 ft.

There are many other examples of manufacturers building long booms [see cut]. I have recently seen an advertisement of Manitowoc announcing a 230-ft boom. Harnischfeger Corp. and Lima also build cranes with very long booms. Link-Belt Speeder has its Hi-Lite boom which will exceed the 140 ft you claim

This is all the room you need to weld with LINDE's "MIGHTY MIDGET"

SHOWN ACTUAL SIZE IN 3-IN. OPENING

. . . New Heliarc HW-20 Torch

HIGH CURRENT CAPACITY

Operates at 200 amperes *continuous* duty, AC or DC. Molded, totally closed water-cooling system eliminates any chance of leaks at torch head.

MINIATURE SIZE

9/16- by 2-5/16-in. torch head permits welding in hard-to-reach areas as small as 3 in. in diameter. Total torch length is under 7 inches.

3.3-OZ. FEATHERWEIGHT

Selected materials, such as glass fiber reinforced phenolic plastic, save weight without sacrificing strength. Torch (with short cap) weighs only 3.3 ounces.

HANDLES LIKE A PENCIL

Exceptional balance, light weight, small size, and super-flexible service lines make the HW-20 torch as easy to handle as a pencil.

For further information, call your local LINDE Office or LINDE Distributor . . . or write: Dept. WE-01, LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, New York.

The terms "Heliarc," "Linde," and "Union Carbide" are registered trade marks of Union Carbide Corporation.

SPECIFICATIONS

Capacity —
200 amp. AC or DC, continuous duty cycle;
225 amp. AC or DC, reduced duty cycle

Weight —
with short cap: 3.3 oz.*
with medium cap: 3.5 oz.
with long cap: 3.6 oz.

Length overall — 6⅞ in.

Length of Torch Head —
with short cap: 2-19/64 in.*
with medium cap: 3-9/32 in.
with long cap: 7-5/16 in.

Maximum Handle Diameter — ¾ in.

Maximum Head Diameter — 9/16 in.

Service Lines — 12½ or 25 ft.

*Torch is supplied with medium cap for 3-in. electrodes. Short cap for 2-in. electrodes and long cap for 7-in. electrodes are available as accessories.

Linde UNION CARBIDE

NOW They are ALL Trade Marked

CURV-O-MARK

The Most Advanced Line of Welding Aids Ever Produced for

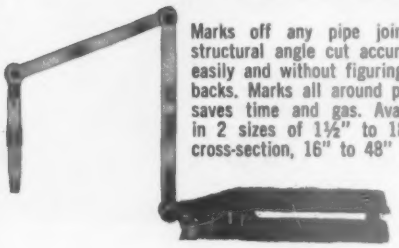
PIPE-LAYOUTS

of ANY Type or Location

Since 1946 we have manufactured four patented welding aids, which are today recognized by Welders and Pipeline Construction Workers as the most reliable and accurate tools ever devised for marking pipes and structural angle cuts of any type, or at any location. Now, after nearly 14 years, we have adopted a Trade Mark for quick identification of each Marking Device — and here they are —

CURV-O-MARK

CONTOUR MARKERS



Marks off any pipe joint or structural angle cut accurately, easily and without figuring cut-backs. Marks all around pipe—saves time and gas. Available in 2 sizes of 1½" to 18" in cross-section, 16" to 48" diam.

CURV-O-MARK

CENTERING HEADS

Really, 5 tools in one — it replaces Protractor, Centering Head, Center Punch, Level and Scale. Eliminates difficult measuring, checking and marking Pocket size—weight only 9 ozs.

CURV-O-MARK

PIPE FLANGE ALIGNERS

For Aligning Slip-on, Top Joint, Stub End and Welding Neck Flanges. This self-centering Tool is quickly adjustable for all types of Flanges or Pipe sizes from 3" to 12" in diameter.

CURV-O-MARK

RADIUS MARKERS

Has marking span of 24" and swings to 48" circle or arc. Pencil holder accommodates round or flat pencils, soapstone and steel points. Unequaled for accurate layout work. Wt. 8 oz., pocket size.

Your Welding Supply Dealer Recommends all CURV-O-MARK Products

CONTOUR SALES CORPORATION

1843 E. COMPTON BOULEVARD • COMPTON, CALIFORNIA

as the tallest in North America.

I think it is interesting that all these have been achieved with the use of alloy steel and without the necessity of having to resort to aluminum.

On behalf of the 16 members of the Power Crane & Shovel Association, I feel that this protest concerning your mis-statement is in order.

J. L. Beltz
Manager Marketing Staff
The Thew Shovel Co.

—Mr. Beltz' complaint is well taken, but we thought it was obvious the author was referring to the "tallest aluminum boom . . ."

Josephine

Sir: *Phnom-Penh, Cambodia*

Could you please tell me when my subscription to *WE* ran out?. . . . Is there any way to obtain the missing back issues?

As I have been home only 10 days since early 1953, and spent half that time unpacking from a job in Iceland and the remainder packing for the job

Reader McIntyre and Josephine . . .

here in Cambodia. I have had little time to get caught up with the world. Especially since early last year when I found myself raising a baby elephant in my spare time. Josephine (pictured about a year ago) is now a little over two years old. Naturally, she is a bit larger now. I intend to take her to my sister's ranch in Oroville, Wash.

As it will be two or three months before I can complete my vacation and get the papers for Josephine, plus getting the boat (and her on it), please mail the subscription information to the Cambodia address.

Basil D. D. McIntyre

Letters should be addressed to: The Editor, WELDING ENGINEER, P. O. Box 28, Morton Grove, Ill. No letter will be published unless signed, but your name will be withheld if requested

Rail welding abroad

Sir: *Johannesburg*

We are regular readers . . . of *Welding Engineer* . . . in the August number, we read the article on welded rails (p. 36).

It may interest you to know that the South African Railways have been using automatic flash butt welding of rails for the last 22 years. They will, within the next few days, be completing their 2,000,000th flash welded rail joint.

In the article . . . it was mentioned that German railways are producing as many as five welds per hour. . . . the South African Railways are producing as many as 20 rail joints per hour on one machine. Of course, the size of the rail is comparatively small —96 lb per yard.

We are enclosing a reprint of an article written by E. A. Whitelock, chief welding engineer of the Railway's civil engineering department, who is responsible for the rail welding in this country.

G. Erenyi
Arc Engineering Supply Co.

More from abroad

Sir: *Eindhoven, Holland*

Being an admirer of your editorials, my eye was caught by the one in the September issue of WE. As it is the general impression here in Europe that people in the States are working so very efficiently and modern, I was embarrassed to find that things do not really differ very much with the state of affairs here.

Co-editor of our periodical "Welding News," last August I wrote an editorial (my very first one) which more or less deals with the same subject as yours, and which confirms the same problem. Though tragic, I was pleased to read it.

One more remark . . . the American business magazine, "Fortune," of October shows on page 39 an advertisement . . . about Mississippi. A picture shows a man busy riveting away. What tickles me most is the heading, "Know growing Mississippi."

Are they really that far behind down South?

J. Stemerdink
N. V. Philips

Plasma physics

Sir: *Spokane, Wash.*

I am doing research on plasma physics and would like as much technical data as possible. In order to carry out this research, it is necessary to build a plasma torch.

David E. Demaray

—In addition to being sent WE *tearsheets, Mr. Demaray was referred to several of the firms engaged in this work.*

BETWEEN PASSES

training in USSR

Last month this department discussed in brief an editorial from the Soviet publication "Welding Production," which complained about the lack of, and stressed the need for, more facilities to educate its welding engineers and technicians.

In another part of the editorial, a more complimentary tone is taken towards its own program, "It should be noted that abroad, in the U. S. A., the German Federal Republic and Great Britain, there are no welding faculties; the instruction of welding engineers takes place only during the period prior to graduation, because of the small number of special courses. In Czechoslovakia and in the German Democratic Republic, on leaving higher technical schools, welding engineers receive instruction at scientific research institutes in machinery construction, general construction and other special subjects. In this way, by comparison with foreign countries, the training of welding engineers in the USSR is more purposeful. Our welding engineers are well fitted for their task. Soviet welding technology occupies a leading position, and it is recognized as outstanding. *The welding of metals in this country is often ahead of research work abroad.* One of the most important factors which distinguish the training of Soviet engineers is the *great attention paid to design,* especially to graduates' theses."

The italics above are ours. They underline thoughts to ponder.

our 44th birthday

With this issue, dedicated to "The Soaring Sixties," WELDING ENGINEER begins its 45th year of uninterrupted publication. Our other magazine, THE WELDING DISTRIBUTOR, starts on its fourth year.

The world of welding has grown so rapidly since L. B. Mackenzie founded *WE* back in January, 1916, that even he—visionary that he was—would be surprised to see the progress. *WE* has (and we have) shared in this progress, and we hope to continue to do so through the next decade and beyond.

wanted: new metals

New metal requirements are only a small part of the 300 new ideas that the armed forces are hoping to extract from civilian inventors. A list of the problems facing the military has been released by National Inventors Council, U. S. Department of Commerce, Washington 25, D. C. You can obtain the complete list on request from NIC at that address.

Among the challenges: a new propellant for long-range space vehicle flight; keeping water from collecting in rifle and gun barrels; a paper-base material for clothing that can be thrown away after use.

"A representative from the grievance committee to see you, sir."

Monautronic V-2 welding quality, cuts rejects and

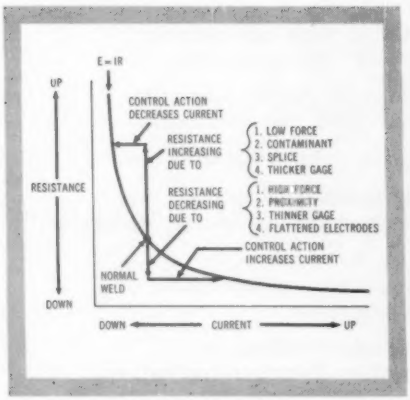
The new Monautronic V-2 welding control introduces the concept of feedback control to produce spotwelds of consistently high quality. It makes use of the latest advances in electronic computing to overcome automatically such obstacles to weld quality as line voltage fluctuation, electrode wear, variations in electrode tip force, surface finish and shunting.

The Monautronic V-2 compensates for undesirable variations usually encountered in resistance welding by maintaining voltage across a weld at a constant value. This constraint of voltage amounts to constraint of final weld temperatures, and such temperature control assures production of quality welds.

- **Automatic lockout**—occurs when process variations are so severe that the available current range would not cover the requirements for quality welding. The control detects extreme contamination, failure in the force system, overwelding, poor matching or fitup, and any other conditions that would result in substandard welds.
- **Automatic sequencing**—all provisions for single spot, roll spot or seam welding. Sequencing is 100% accurate, and exceeds NEMA standard specification 3B. Special sequence programming is available.
- **Transistorized design**—for high reliability, compactness, low power consumption.
- **Modular construction**—permits easy removal of the three modules and separate firing unit, simplifies maintenance.
- **Shock and vibration resistant construction**—for long, reliable service in even the most demanding applications.
- **Safety interlock**—for protection of personnel during tip dressing.
- **Tamperproof case**—prevents access to control by unauthorized personnel.

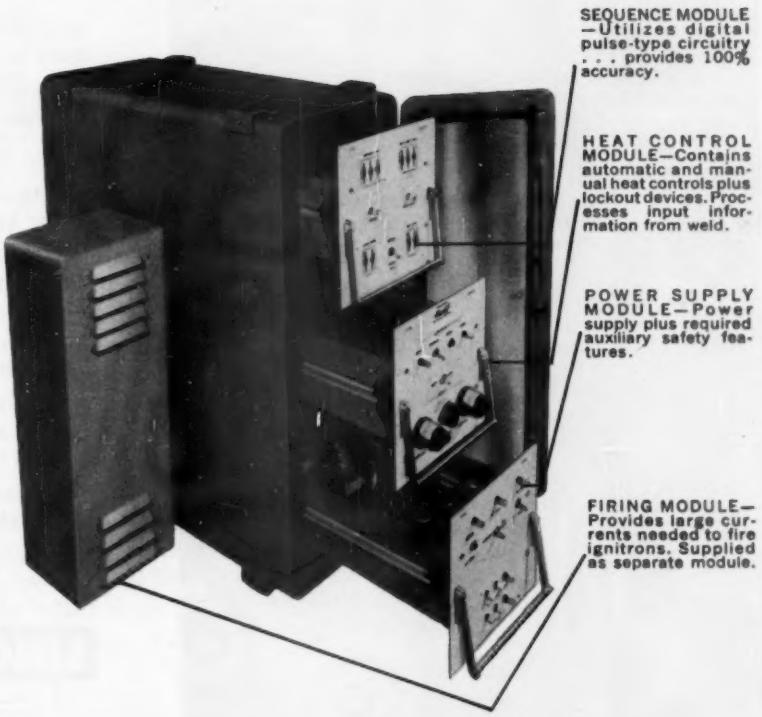
control certifies weld production costs

A resistance welding control that automatically compensates for every process variable



VOLTAGE CONSTRAINT

Graph shows how voltage control compensates for process variations. Any point on curved line E = IR represents a specific voltage. With normal weld as reference point, certain process variations cause increased resistance, while others cause a decrease. Control action is achieved through change of current to constrain voltage to same level for every weld.


SEQUENCE MODULE—Utilizes digital pulse-type circuitry . . . provides 100% accuracy.
HEAT CONTROL MODULE—Contains automatic and manual heat controls plus lockout devices. Processes input information from weld.
POWER SUPPLY MODULE—Power supply plus required auxiliary safety features.
FIRING MODULE—Provides large currents needed to fire ignitrons. Supplied as separate module.

for complete details contact: THE BUDD COMPANY • Electronic Controls Section • Philadelphia 32, Pa.

ELECTRONIC Budd CONTROLS

Once you've tried
Jetweld Low-Hydrogen Electrodes,
you'll agree with us when we say,

There's no such thing as hard-to-weld steel!

Sulphur-bearing steels that normally can't be welded without porosity—

High-tensile steels that are susceptible to underbead cracks and microcracks—

Heavy plate on which welds often crack—

All are welded easily and successfully, in any position, with Jetweld Low-Hydrogen rods.

An iron powder coating makes for fast, smooth operation.

And three tensile classifications handle every Low Hydrogen application.

Jetweld LH-70, E-7018,
Jetweld LH-90, E-9018-G,
Jetweld LH-110, E-11018-G.

Try them for the very finest physical properties and on steels you thought were tough to weld.

LINCOLN ...USA

THE LINCOLN ELECTRIC COMPANY
Dept. 1763 • Cleveland 17, Ohio

The world's leading manufacturer of arc welders and electrodes, ac motors and battery chargers.

JANUARY, 1960

Welding Engineer

ESTABLISHED 1916

Meet the challenge

"INSTEAD OF LOVING your enemies, treat your friends a little better," said Kansan editor and author Edgar Howe. Sounder advice for starting the New Year is difficult to find.

But we're not only starting a new year, we're also starting a new decade —a decade which gives every indication of becoming the most fabulous in history.

We will see tremendous growth on every hand, and an era of unequalled industrial progress in which welding will play a major role—*if those of us in welding are ready and willing to meet the challenge.*

In this issue you can read what some of the nation's leading welding authorities feel is in the offing for our industry. The processes have been developed; all we have to do is see that they're put to work.

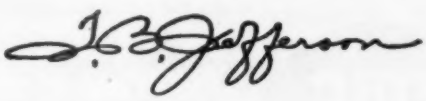
You would think the reasons for using welding are well-known to everyone in the metals industries. Unfortunately, that's not the case. There are still many fabricators not familiar with welding's advantages.

There are also too many manufacturers not fully aware of what can be done with its judicious use in product design. In most cases, the welded redesign results in a superior product, more pleasant in appearance, more durable, lighter in weight, stronger and usually less costly.

One New Year's resolution would be to point out the advantages of welded construction to every potential user. If we all did this, welding would make tremendous gains.

We in the welding industry have traveled far, and the next 10 years will take us even further, but it will still be necessary to educate certain groups on the values of this modern joining method.

It will take the efforts of *all* of us to remove the roadblocks.

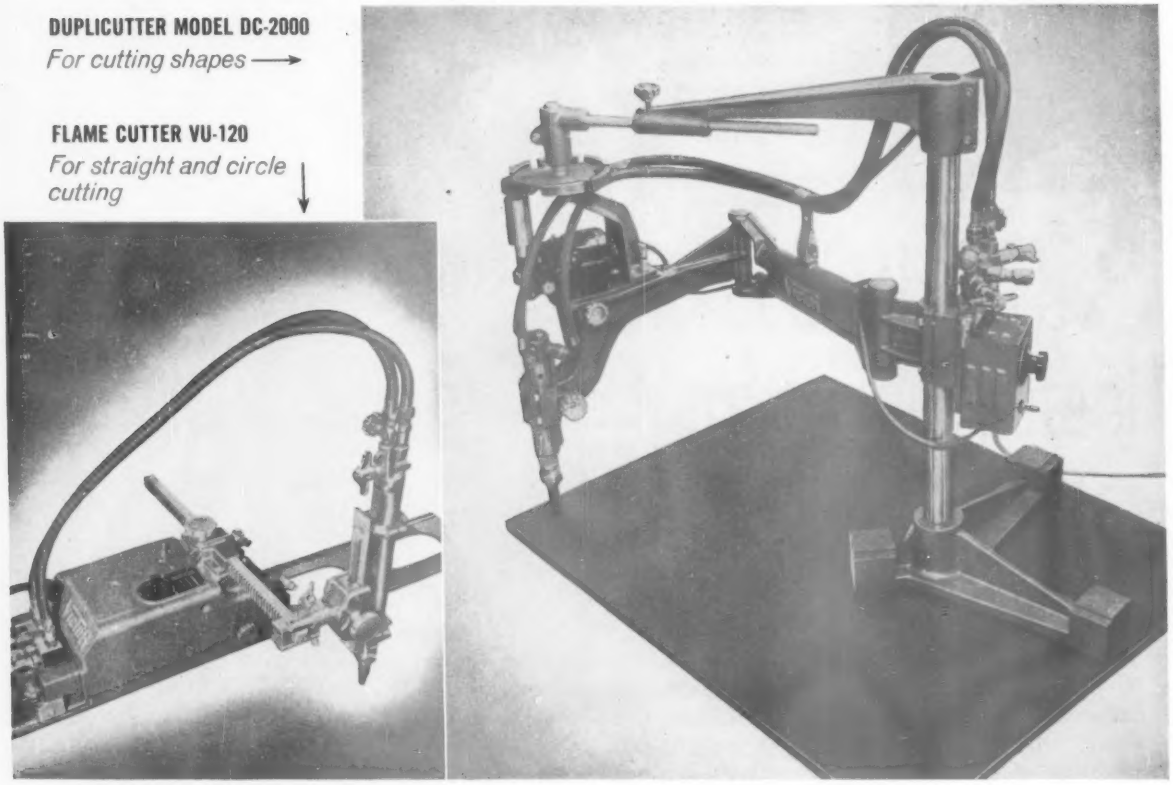


SPEED YOUR PRODUCTION

with these Victor Cost-Cutters

DUPLICUTTER MODEL DC-2000
For cutting shapes →

FLAME CUTTER VU-120
For straight and circle cutting ↓



Victor Flame Cutter, Model VU-120

- Cuts straight lines, square or bevel kerfs, circles to 96" diameter
- Adaptable to submerged or inert arc automatic welding.
- Travels 0 to 180" per minute forward or reverse; variable speed transmission provides full power over entire range.
- Free-wheeling neutral for easy positioning.
- Accommodates both 2 and 3-hose torches, with or without gear rack.
- Second torch holder available for parallel cutting.

Victor Duplicutter, Model DC-2000

- Duplicates shapes up to 19½" diameter circles, 12" x 35" rectangles.
- Holds tolerances of plus or minus 1/64" in 2" steel.
- Templates easily changed, making practical both long runs or a single copy.
- Weight, 36 lbs. — easily carried.
- Magnetized feet set on stock being cut — no levelling needed.
- Uses Victor cutting tips thru size 5.

To see how Victor Cutting Machines can speed your production, ask your Victor dealer for a demonstration . . . or write us for descriptive Bulletin 353.

VICTOR® for cutting

Profitable dealerships open in a few areas; inquire now.

VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; high pressure and large volume gas regulators; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines. 56

844 Folsom St., San Francisco 7 • 3821 Santa Fe Avenue, Los Angeles 58
1145 E. 76th St., Chicago 19
J. C. Menzies & Co., Wholly-Owned Subsidiary

The Happy New Year Baby of 1960 will be symbolic of the 1960-69 decade. Our population is estimated to expand in 10 years at the average annual rate of over 3½ million.

By the mid-sixties, the great number of so-called "war babies" of World War II will marry, set up separate households and raise families. This will create a fresh market for houses, furniture, appliances, autos and other family necessities . . .

We must have sustainable economic growth if America is to continue to wax strong, keep safe and stay free.

Frederick H. Mueller
Secretary of Commerce

WHAT THE SOARING SIXTIES will bring to American industry is fairly well determined by trends that have already been set.

Thus, in the overall picture, it appears that prosperity will be with us most of the time.

There will, of course, be booms and recessions, as there have always been, but the general trend will be upward. It will be a period of opportunity—but also one of problems.

As the above statement by Secretary Mueller indicates, an expanding economy is geared to an expanding population.

THE SOARING SIXTIES . . . . . .

The U. S. Census Bureau states that by 1970 our population will exceed 215 million people (36 million more than at present) who must be fed, clothed, housed, educated, transported and entertained.

This expanding populace will find the downtown areas of our big cities becoming more congested, and vast expenditures will be needed to handle these traffic problems. As a result: more people will be moving farther away from town, leading to a decentralization of industrial facilities.

Industry itself will have to care for 14 million more workers than we have today. (In a recent poll of industry leaders, 50% said they will hire more people in the coming year; 45% expect the same employee level.)

And the more workers we have, the more children will be in school—meaning the taxpayer will be faced with a heavier load.

More taxes will be required not only for the increased number of schools, but for the expanding roads, water and sewage systems, parks and recreational facilities demanded by this growing population with its increased leisure time and purchasing power.

In many areas the water problem will be serious and undoubtedly more welded pipelines will be needed. But welded pipelines, the use of which will also expand for transporting many different materials, will represent only a small part of the tremendous growth welding should experience in the next 10 years.

If it is to provide the necessary goods and services for the sixties, industry will have to invest heavily in more modern and efficient machinery. (In the same survey of industrial leaders, 43% stated they would spend more for expansion in '60 than in '59.)

In the 10 years ahead, it is predicted that overall business activity will rise to nearly $700 billion a year, assuming there will be no price increase. With the annual gross national product running at approximately $480 million a year now, this will mean a 45% increase in business activity.

The metalworking industry alone expects to be a $375 billion a year industry by 1975 (an increase of 150%). Sharing in this anticipated growth, welding can look forward to its first billion dollar year.

The estimated population increase will create nearly 62 million households, 10 million more than today. This in itself means a huge and growing demand for new houses, as well as the furniture, appliances, lighting fixtures and other things to make it a home.

It also means there will be more automobiles. By 1970 people will probably be buying 8 million cars a year, calling for increased facilities; increased use of welding not only for the final product, but for the machines that make it as well.

The nation's steel requirements in the next decade are expected to jump to 160 million ingot tons per year, compared to 95 million now being consumed. And the demand for aluminum is expected to be nearly 12 billion pounds, three times the amount used in 1959. Electric power output will nearly double.

Industrial and product improvements are limited only by the imagination of the engineers and designers. From today's research we know the home of the sixties will have better and different heating systems and new kinds of stoves and appliances.

Again, automation will forge ahead rapidly, and welding automation will lead the way.

Often when automation is introduced into an industry, the workers fear a trend to eliminate them. However, it is rare when this proves true.

There are times, of course, when people are forced to change, just as the blacksmith had to change to an auto mechanic. But today there are more mechanics than there would ever have been blacksmiths had we continued living in a horse and buggy era. The same is true of welding and automation.

Automatic and semiautomatic welding processes make it possible to reduce welding costs. And as a result, the weldor is not eliminated, rather he is given new tools with which to work. Thus, he can produce more at a lower cost, expanding the opportunities for welding and insuring his continued employment.

During the first five years of The Soaring Sixties, the demand for manual arc welding electrodes will be doubled, and the processes which are just now coming into being will have increased in use a thousandfold.

For example, 10 years ago electron-beam welding plasma heat, magnetic girdle pipe welding, and explosive cutting, welding and forming were either unknown or at least only laboratory curiosities.

Yet in the several months in which these processes have been announced to the general welding industry, they have reached production status and their use increases in leaps and bounds.

For welding reactive or refractory metals, electron beam has proved its worth. Basically it fuses metals in a localized area by bombardment of parts with a beam of high-energy electrons emitted from a modified X-ray tube.

Welding is done in a vacuum chamber and although high voltages are required, amperages can be less than 0.2.

Plasma heat welding harnesses the highest controlled temperatures ever used in industry (up to 30,000 F and hotter than the sun's surface). Plasma, which is neither gas, liquid or solid, results from the electrical heating of a gas to such high temperatures that its molecules become ionized atoms containing high energy.

Because of a thermal pinch and the resulting restricted

. . . . . and what they mean to you

and resisting current, the pressure forces developed cause ejection of plasma in a stream or jet at high temperatures and speeds. Its uses range from metallizing and gouging to cutting and welding, especially on materials previously difficult to weld.

Still another space-age innovation during the past year is explosive welding and cutting which approximates a prediction made in WELDING ENGINEER's 40th anniversary issue on acetylene chalk.

The prediction saw this chalk being applied to a plate, then placed in an oxygen-filled chamber and an electric potential placed across it.

Cutting can now be done with a flexible sheet-explosive that can be cut with a fixed-blade knife to correct size and shape, then molded to fit the contours of the work.

Using a high-powered electric blasting cap in material capable of transmitting the shock waves (usually water) the explosive sheet can harden as well as cut the metal.

Several aircraft and missile manufacturers have been metal-forming with other explosives for some time now, and recently the use has been extended to welding. Preliminary welds by one firm have been successful on aluminum to aluminum, aluminum to Inconel, aluminum to stainless, stainless to itself, and aluminum sandwiched between stainless.

As well as these process innovations in the past year, many refinements on older processes were introduced, including several improvements in carbon-dioxide Mig welding, larger ultrasonic welding and cleaning units, electronic tracing equipment for flame-cutting, high-frequency spiral tube welding and many more.

Another process, electroslag welding was introduced in this country in the early part of 1959. The process involves the fusion of parent metal and continuously fed weld metal under a substantial layer of high-temperature, electrically conducting molten slag. It is used mainly to weld vertically plates of medium and great thickness.

So when crystal-gazing into the future, we should remember Abraham Lincoln's words: "The only way we have of judging the future is by the past." And judging by the progress welding has made in the past few years, the future should offer unlimited opportunity.

But least we get carried away with thoughts of nuclear welders and joining wood, glass and metal instantly, it might be well to quote the words of AWS past president Joe Humberstone, who at a fall meeting of AWS cautioned the delegrates not to "over-emphasize the new, for I submit that the oxyacetylene flame will never grow old . . . the stick electrode will continue to be used."

And here are the opinions of some welding industry leaders on what The Soaring Sixties will hold.

TECHNOLOGICAL DEVELOPMENTS are proceeding at an accelerated pace today and we can expect some important and startling ones in welding.

In pressure welding we can expect considerable developments in diffusion bonding of some of the more exotic metals. In pressure resistance welding, new power sources, such as the magnetic force welder, have indicated a vast potential. Friction welding will also have some application.

Vacuum welding, such as electron beam, will find new areas of use. Plasma arc has indicated there are definite possibilities for welding applications, and its present application for deposition of metallic and ceramic coatings will definitely increase.

In the field of brazing, sandwich construction will have a vast potential in the coming decade. The brazing process itself will be materially improved by new alloys as well as the application of heat by induction and high resistance methods.

John J. Chyle
A. O. Smith Corp.

AN APPRAISAL of the future of aircraft welding must be based on those things which we have seen happen during the more immediate past.

Inert-gas shielding revolutionized the approach to welding about 10 years ago. The turbine engine, largely a sheet-metal welded engine, has made it possible to fly higher and faster, which in turn, brings problems in air conditioning.

To effectively air-condition large aircraft, huge quantities of lightweight ducting are utilized, which involve many lineal feet of welds on corrosion resistant steel alloys not much heavier than tissue.

What will tomorrow bring? We can only assume that the trend will stay in much the same direction.

Greater use of welding offers many new opportunities in welding engineering and related fields. The design engineer cannot simply draw a picture of two pieces with an arrow and say "Weld it." He must understand how welding is done so that he will not unnecessarily create joints which are hard to weld or poorly located from a stress standpoint.

Engineers experienced in riveting will require re-education. Weldors will have to gain a greater knowledge of both their processes and the material being joined. This means more science and less art.

There is a bright future for welding in the aircraft industry.

Charles B. Smith
Douglas Aircraft Co.

DURING THE '60's the use of all present welding processes will continue to expand. This will take place because of the overall growth of the metal market, which in turn will evoke tremendous advances in welding technology.

We can anticipate new welding processes, new welding products, new marketing methods, higher personnel quality and product management with new foresight. Obsolescence will not creep into any of the welding product lines, but we will see re-emphasis on certain of the newer items, *e.g.*, iron-powdered and low alloy steel electrodes.

Welding as a whole will require maximum automation and will require, for some materials, special welding processes. New controls will make the arc follow a weld seam exactly, and will control the rate of increase and decrease of welding power as needed for various portions of the weld joint.

New processes will further expand the field of welding. Contrary to some current opinion, these new techniques will not make appreciable inroads on established welding processes, but should contribute to expanding welding applications in new areas.

Possibly the greatest increase in welding will be in simply educating the country's designers in its use. Many times welding is not used because an attempt is made to apply it to an old design. Great economies could be achieved if the entire design were reworked to make use of welding's advantages.

R. E. Lenhard
Air Reduction Sales Co.

THE RECORD that arc welding has made (in more than a generation) certainly should revise the present standards which have increased the cost of its use enormously. Because of the cost and consequent suspicion of welding that these unnecessary tests produce, the use of welding has been eliminated in many places where it could be of tremendous service.

Its application in buildings, bridges and the redesigning of castings and forgings would save many billions that old designs and methods now require.

A new view should be taken of welding standards. Deposited weld metal is much better than parent metal which has been rolled from an ingot, far from a perfect structure compared to the weld metal.

A welded joint of the same dimension and analysis as parent metal in mild steel is always superior. Why, then, should not welding be accepted without question as is now done with a riveted or bolted joint, either of which cannot, under any condition, be equal to full strength of the parent metal. The economy cannot allow the present waste in our welding inspection policies to continue eliminating the savings and advantages welding can contribute.

James F. Lincoln
The Lincoln Electric Co.

WE BELIEVE it certain that continuous-fed electrode welding, manually applied on steel, will acquire a substantial portion of the steel welding market during the '60s. Between 5 and 10% of the market today is supplied by this method of welding, and it will certainly gain an increased share.

We can safely say that as the opportunities for welding production increase with increasing technology, and increasing public acceptance, the opportunities of the distributor must inevitably be broadened in proportion. A superior marketing job will be required in all its aspects—salesmanship, training, advertising, etc.

The best existing ideas cannot find their proper position in production without thorough marketing.

H. E. Rockefeller
Linde Co.

BRAZING IN THE NUCLEAR AGE, welding stainless and low alloy steels, welding dissimilar metals, as well as ultra high-tensile steels are current items on which progress is being developed to improve quality and increase production. It is my personal opinion that welding holds a bright promise to expansion in a great many industries during the next few years of "The Soaring Sixties."

C. P. Sander
Consolidated Western Steel Div.
United States Steel Corp.

WE VISUALIZE the '60s as a three dimension, multi-drawer filing cabinet. Roll out each drawer and let imagination soar. There is at least some knowledge of "how to" in almost every drawer already.

For instance, consider Drawer A, cutting of metals by plasma. Technical articles already are being published. There still remains the development of equipment, compiling data and spreading the word.

It is safe to say, then, that the potential of welding's future is almost unlimited. The one obvious and very serious limitation to that future is the availability of sufficient numbers of trained people.

G. E. Cossaboom
Westinghouse Electric Corp.

THE MAJOR IMPETUS in the '60s will come through application of high strength materials. Welding, along with its allied fabricating operations, will be hard pressed to keep pace. However, development in this area thus far has been encouraging.

We are aware of potential applications of high strength materials, as well as their difficulties. We know there is a practical measure for their use, and the extent of this use will depend on how effectively we can manipulate, blend in and live wih welding techniques.

Generally speaking, we see a trend toward semiautomatic and automatic welding with less emphasis on the use of coated electrodes. Flash and induction pressure welding will become more prominent.

We in industry using welding as a fabrication tool will have to formulate simplified and well-controlled welding techniques, and speed up welding training.

A. L. Jerome
Caterpillar Tractor Co.

AS WE SOAR into the sixties, there is no question that there is little wrong with the world that a little common sense and welding would not fix.

Welding can and will advance at its greatest pace in a free and competitive market, which must go beyond the bounds of the 50 states. The challenge today is to produce more and better products for less money if we are to survive in our own economy. Only through superior methods and automation can we hope to keep even, let alone stay ahead of those producing the same or similar products not demanding the high standard of living normal to us.

The better use of welding knowledge is the keystone. Most certainly there will be new methods, new systems, new equipment in the coming 10 years, but they will not necessarily be revolutionary. Change and refinement is a natural process.

Welding in all its forms will reach for and attain a much greater degree of maturity in the coming decade. Ground will be gained only through continued preachment of those who know and recognize its value to mankind.

R. L. Townsend
Tweco Products, Inc.

THE NEXT 10 YEARS will see some very drastic changes in welding products, processes and applications. There will be many new developments in welders for the aluminum and stainless materials, especially in aircraft applications.

I am also quite sure there will be many new welding electrodes developed for the welding of very high tensile materials for missile programs and general products, using new high-tensile steels now in production and even newer high tensile steels being developed.

If the welding industry was not handicapped by very low prices, many new processes, welders and electrodes could have been developed by now. The lack of reasonable profits naturally curtails monies spent for research and development.

I sincerely believe the industry has been hurt in this programming and is approximately five to 10 years behind. Perhaps in the not too distant future, the necessary monies will be made available so that the welding industry will find it possible to keep up to date with the rest of the country's growing needs.

M. O. Monsler
Harnischfeger Corp.

THE MOST SIGNIFICANT change in resistance and arc welding in the next 10 years will be that welding machinery as such will generally lose its identity. This is currently illustrated by the fact that a tube mill is referred to as a "tube mill," whether tubing is made by resistance, arc, gas or induction heating.

The drive to reduce unit labor costs of the fabricated product will be stepped up intensely, resulting in the combination of many metal processing and work handling operations (including welding) being performed by the same group of machinery units.

These groups will be conceived, planned and coordinated by machinery manufacturing companies serving the product fabricator in the same manner as construction architects presently operate.

The equipment will be automatically adjusted for different sizes, and for addition of different attachments. Punch cards, tape or similar systems will pre-select and monitor the equipment.

Automatic inspection processes will mark and separate inadequately welded or formed units from prime ones. Design, development and maintenance groups will be equally familiar with electrical, hydraulic and pneumatic circuits of increasing complexity and reliability.

The number of manufacturers of *components* for welding equipment will increase and the number of manufacturers of major processing lines where welding predominates will probably decrease.

J. H. Cooper
The Taylor-Winfield Corp.

THE COMING DECADE promises to provide manufacturers of welding equipment with a market 25% higher than the peak reached in the '50s. Major industries which will primarily influence this increase will average 30% higher; construction machinery, 40% higher; agricultural machinery, 25%; and fabricated metal production, 25% higher than in the '50s.

The durable goods index of production should reach a high of 200. Sales of electrodes, which are closely related to this index's movement, are expected to reach a level of 750 million pounds annually by 1965. Arc welding machine sales should total over 125,000 units per year.

With potential volumes like these, the producers of welding equipment will contribute their share of boom to the coming decade.

G. E. Kemper
A. O. Smith Corp.

THE BEGINNING of each year creates an opportunity for "forecasts of future developments." The beginning of a new decade presents an even greater temptation to give imagination free reign and base predictions on hopes and dreams.

During the past five years the annual sales of gas, arc, resistance welding, and cutting equipment and supplies has approximately doubled in dollar value. Our long established annual growth in industry, using past averages or the confidently predicted increased rates, compounded for the next 10 years will result in impressive gains.

The welding industry, measured by sales, during the past 10 years has been growing at a rate almost three times that for our gross national product, about two times that for all durable goods. One expert conservatively predicts that 1959 welding industry sales will be doubled in 1965.

Certainly many of the new welding processes will prove effective and economical, making possible many applications now not practical and thus, broadly expanding the use of welding.

Fred L. Plummer
American Welding Society

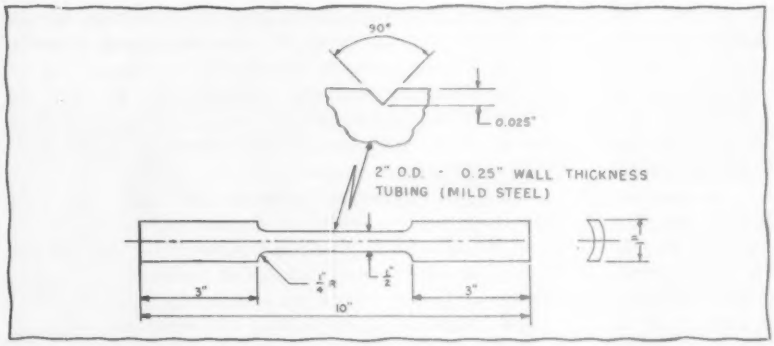


FIG. 1—Specimen design for static tension test to determine the cause of brittle fracture.

Fundamentals of *brittle fracture*

by **Bela Ronay**

BRITTLE FRACTURE, an old acquaintance of engineers and scientists experienced in fatigue testing of ferritic steels, received its major notoriety from failure reports on Liberty ships.

Brittle fracture and fatigue failure are inseparable. Before metal fatigue properties became widely known, failures in ferritic metals were diagnosed as "crystallization."

This referred to the coarse, crystalline appearance of the area surrounding the fracture's smooth portion. Eventually, the term "crystallized" was abandoned and the appropriate "brittle fracture" accepted. The mechanics of brittle fracture development are well understood.

Fatigue failure in ferritic steels will occur only after a flaw has gradually spread and grown to occupy a minor, but important, portion of a cross sectional area. Load distribution then becomes complicated.

Instead of being in plain tension in one direction only, it pulls on the cross-section containing the flaw, in all directions at the same time. Under such conditions, the metal cannot stretch, and parts with a brittle snap. Thus, the fracture's coarse, crystalline appearance.

Note that fatigue failure occurs only in structures subject to alternating stresses, *e.g.*, shafts, beams, shapes and plates exposed to loads in alternating torsion, or bending first from one side then the other.

Failure of the *S. S. Schenectady*, however, occurred while the ship was under a dead-load at its berth, fracturing in a brittle way. Structures were known to fracture in this manner under hydrostatic pressure only. Thus, it was evident that brittle fracture can, and does, occur under static loading also.

The mechanics of brittle fracture development under static loading are similar to those for dynamically loaded structures, but there are certain complications.

Before brittle fracture occurs under static loading, there is an originating or triggering flaw just as in dynamically loaded structures. This flaw causes a stress concentration to occur in the cross-section where it is located.

When a transient additional load is imposed, the stress around the flaw also increases. Up to a point, the increased stress is satisfied by a corresponding strain of stretch developing around the flaw. Whether the metal continues to stretch with the increased stress depends on metal temperature.

The temperature level at which the metal becomes subject to the same restrictions to stretching as dynamically loaded structures, depends on the composition and heat treatment of the steel. Generally, the coarser the steel's microstructure, the higher the temperature level at which it may fail.

Thus, unheat-treated, plain low-carbon steel castings are the least suitable for service where lower-than-normal temperatures occur. These steels are prone to brittle fracture when stress distribution becomes critical above the normal 70 F.

Most low-carbon, wrought-steel plate stock, usually available in the annealed condition only, is prone to fail by brittle fracture when the stress distribution becomes critical at temperature levels above the freezing point, often around 40 or even 50 F.

Stress distribution around a flaw cannot be visualized. Even the most advanced methods of strain measurement are insufficient to provide direct, complete information. However, scientists were able to obtain authentic data on strain development by the photoelastic method.

From these investigations it was learned that, depending on the ratio of flaw area versus cross-sectional area and the sharpness of the flaw-caused notch, stress concentrations may reach from three to nine times the value of the stress caused by the applied load.

High stress developed by local stress concentration alone, however, does not necessarily produce brittle fracture in static loading. This will occur only when the temperature is also at a critical level. The range of the temperature level, where stress concentration becomes critical, varies from steel to steel and even between plates of one given grade.

Fabricators of steel structures must, therefore, test the materials they intend to use as regards susceptibility to brittle fracture at the lowest temperature range that may occur in the intended service.

Although there is no standard test, the Charpy V-notch impact test is used most often. It uses an arbitrary criterion of 15 ft lb energy absorption at the lowest temperature assigned to the intended structure. There is no direct relationship between this test and the stress development at static loading.

A static tension test appears to reveal the effect of temperature as the cause of brittle fracture in the presence of a fixed stress concentration value. Specimen design is shown in figure 1.

This test was recently used in the investigation of a casualty caused

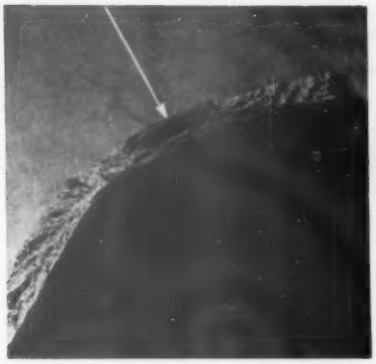


FIG. 2—One typical fracture of the 87 counted in a large number of tube bends which failed by brittle fracture.

by a freeze-up in which a large number of tube bends failed by brittle fracture, each triggered by a ductile fissure. Figure 2 shows one typical fracture of the 87 counted.

These fractures illustrate clearly the mechanics of brittle fracture:

(1) A flaw developed under normally excessive hydrostatic pressure as a ductile or shear fissure.

(2) The ends of the flaw formed sharp notches, which developed high stress concentrations.

(3) The low temperature (obtained when the trigger flaws developed) was critical in combination with the high stresses in the zones of the stress concentrating notches. Consequently, the original ductile fracture continued to propagate in the brittle fashion.

Notched tension specimens made from companion tubes were tested at various temperature levels. As test temperature was lowered (see table), the tensile and yield strength values increased somewhat, while ductility decreased considerably.

Ductility of the steel, even at 0 F where it failed in the brittle fashion, is about the same at 40 F. Lack of ductility at the plane of fracture at 0 F is proof of a high order, three dimensional stress that did not reach critical value at the temperature level.

Who should be concerned with brittle fracture: fabricators of unfired pressure vessels only, or are other weldment types involved?

Unfortunately, there is no direct answer. Perhaps it is most advisable to say the intended service conditions should be analyzed for each weldment. And possible effects of brittle fracture failure should be evaluated as regards disruption of service, damage to other equipment, and last but not least, danger to human life.

For the conscientious fabricator, the possibility of brittle fracture failure is a matter for serious consideration. Since every flaw, no matter how small, is a potential source of brittle fracture in ferritic steel weldments, how can he guarantee the safety of any structure subject to temperature variations to below normal?

Serious and difficult as the task may be, it is not beyond our understanding and ability to predict if a weldment is safe for use.

(1) Consider the weldment's general design characteristics, remembering that stress concentrations are the prime source of brittle fracture at a critical low temperature. (Thus, sharp corners, sudden changes in cross-section or direction of stress must be avoided.)

(2) Residual stresses developed because of restricted weld shrinkage may be contributors also to brittle fracture if a flaw is located in the zone of peak stress. Some weldments are freed of residual stresses by post heat treatment; however, others cannot be so treated.

For this latter type, residual stresses must be kept at a minimum by other means, *i.e.*, localized preheating, sequencing the weld increments, or a combination of both. These are engineering tasks and should be done by qualified persons.

(3) The most effective means—and the most expensive—is to use steels not prone to brittle fracture at their lowest intended service temperature. Determination of this property requires expensive tests using either the Charpy V-notch impact specimens or notched tension specimens as in figure 1.

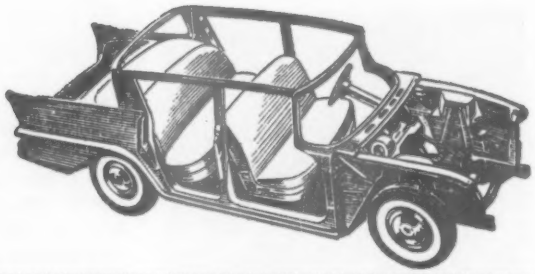
There are some safeguards against brittle fracture even if the metal has not been shown free of possible brittle fracture.

Frequent inspection using means capable of revealing even small fissures is one applicable method. The value of inspection depends on the relationship of the frequency of application versus that of temperature variations. Inspection that does not take into consideration the most severely stressed portions of the weldments and does not explore the latter parts most minutely, is merely an empty gesture.

When cost considerations permit, there is a positive method of assurance against the possibility of brittle fracture — using either austenitic steel or non-ferrous metals in the structure. These metals will not fail either in dynamic or static loading; they are foolproof where brittle fracture is concerned.

Specimen No.	Notch	Temp. F	Area sq in.	Yield strength, psi	Ultimate strength, psi	Elong. %
1	no	0	0.117	51,300	72,600	25
2	no	0	0.115	48,700	70,300	27
11	yes	0	0.108	64,800	81,600	14
12	yes	0	0.106	51,900	75,500	16
3	no	30	0.123	57,000	72,500	31
4	no	30	0.116	44,800	69,200	32
5	no	30	0.124	58,900	75,200	30
13	yes	30	0.108	53,700	74,700	17
14	yes	30	0.105	55,200	80,400	17
6	no	60	0.123	48,800	70,700	31
15	yes	60	0.105	60,000	78,900	14
16	yes	60	0.114	55,300	77,300	14
7	no	90	0.124	46,000	65,200	33
8	no	90	0.121	53,700	71,800	29
17	yes	90	0.114	45,600	68,500	17
18	yes	90	0.110	52,700	74,800	14

NOTCHED tension specimens tested at various temperatures showed somewhat increased tensile and yield strengths and considerably decreased ductility when test temperatures were lowered.



The pioneer of unitized bodies is first again

Multiple-power sources invade automotive field

by **F. T. Tancula**

THE SHIPBUILDING and construction industries have seen the greatest application of the multiple-operator welding power sources. But a beachhead has now been established in the automotive field.

The American Motors Corp., which produces the renowned Rambler at its Kenosha, Wis., plant, recently installed three such silicon rectifier sets in the miscellaneous sheet metal assembly department. The 750-amp machines are manufactured by A. O. Smith Corp., Milwaukee.

Although multiple-operator welding is not new, the use of rectifier d-c power sources instead of motor-generator sets is comparatively recent. During World War II, constant-potential m-g sets with series resistors were used to build most of the ships in the United States.

Today, heavy-duty welders for multiple arcs are primarily d-c rectifiers, although by no means are they the sole source. Certain generators of large capacity are capable of providing more than one arc with use of the series resistor grids. These grids are needed to obtain the drooping volt-ampere characteristic required for most welding processes.

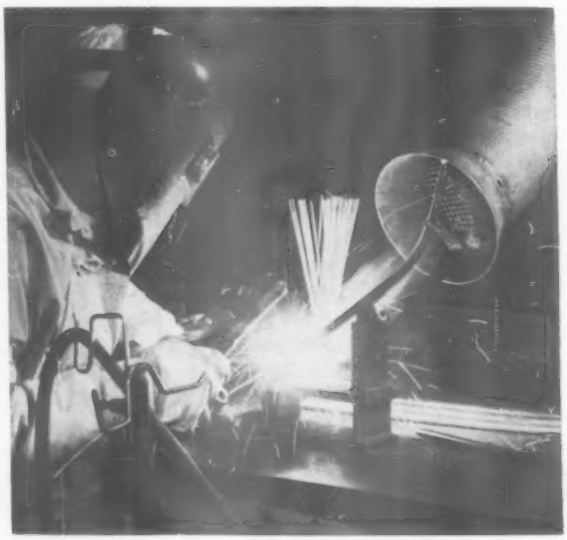
The three welders at American Motors are wired in parallel, thus are able to provide more than enough arcs for the 13 welding booths in the department. Eleven are manual welding stations, while two are automatic stud welding setups.

The 750-amp units are mounted on a platform suspended from the ceiling of the Kenosha plant, and current is transmitted to all weld stations by means of copper bus bars. Both lead and ground cables come into the booths off these bars. Each booth has a single-operator resistance grid from whence the weldor controls his current requirements.

The three power sources and 13 grids replaced 17 motor-generators, four of them special units paralleled in groups of two for the stud welding operation. Reduced original costs, lower maintenance costs, and higher operator morale because of less noise are chief advantages of the switch to rectifiers, it was said.

About 100 small sub-assemblies are produced by the department in which the installation was made last May. One day's production might consist entirely of several thousand pieces of three or four different parts, with another day's output concentrated on six or seven other parts.

At the time *WE* visited the Ram-



MILD steel mounting bracket and retainer ring are welded to the oil dip-stick tube, using a 1/8-in. diameter E6012 electrode at 130 amp.

STUDS are welded to shock absorber tie-plate. Current is 2,000 amp; studs are ¾-in.

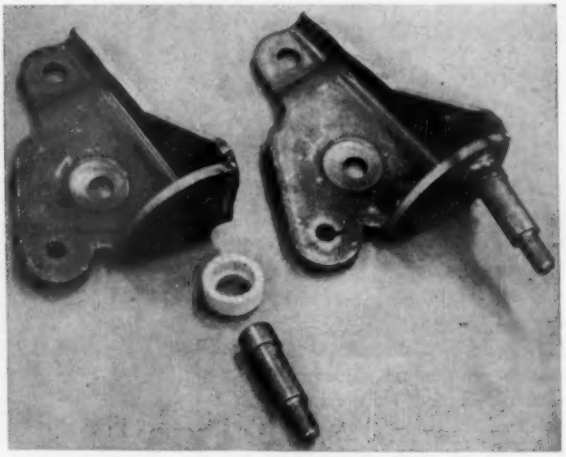


PHOTO above shows shock absorber tie-plate, ferrule and ¾-in. stud before and after welding operation as shown in photo at left.

bler plant, daily output of the two-shift workday was 1,800 cars. Since the production rate of these small parts is far greater, the miscellaneous sheet metal assembly department need not be working daily on every one of the 100-plus items it turns out.

A typical example of an assembly is the brake pedal bracket, wherein an 18-gage mild-steel pedal is joined to a mild-steel forging. The electrode used in this particular instance is an E6012, ⅛-in. in diameter. Current setting is 180 amp.

Another assembly welded with the new power sources is the oil dipstick tube. The 18-gage tubular receptacle is joined to an 18-gage bracket—both are mild steel. Again, an E6012 electrode of ⅛-in. diameter is the filler metal, but here amperage is 130.

A double welding operation is necessary on the shock absorber mounting bracket, which is ¼-in. plate. The open seam at one corner of this piece is closed with a one-pass weld, using a 5/32-in. E6013 electrode at 200 amp. The bracket is then sent to one of the two stud welding stations, where a ⅝-in. stud is welded to the top section.

The stud welding operation requires high amperages—up to 2,100 or more—but the stud welding cycle is so short, and the output of the welding power source so constant, that weldors in other booths are unable to tell when the stud welding operation takes place. The weldors seldom, if ever, attain a 50% duty cycle for any extended period of time, and as a result, many arcs are powered from less total capital equipment.

WELDOR joins clutch pedal and arm assembly with E6012 ⅛-in. diameter electrode using a current of 180 amp.

Herein lies the secret of the multiple-operator power source.

To calculate the number of arcs that can be powered from a single 750-amp or 1,500-amp unit, the following formula is used:

Unit rating ÷ duty cycle = current available;

Current ÷ individual arc current = number of arcs.

Basing our calculations on optimum conditions of a 60% duty cycle, we divide 750 by .60 to get 1,250 amp. This amperage, in turn, is divided by 180 amp (average current required by the 5/32 and ⅛-in. electrodes used by the miscellaneous assembly department), giving us approximately seven arcs from each 750-amp unit.

However, a more realistic duty cycle would be about 25%, for even weldors on an incentive basis seldom approach the 50% factor. If seven weldors were to weld continuously from one unit, they would have available only 107 amp from each grid, thus would require two instead of one 750-amp power source. But utilizing the 25%-average factor, we arrive at an amperage of 428 per man—still a conservative figure.

Thus, short time welding operations requiring high currents, such as stud welding, can be combined with other varied welding jobs from the single source. And, A. O. Smith notes, the units are designed to share the total load equally when paralleled, as they are at the Rambler plant.

Arc welding design awards

SOME 72 ENGINEERS from 54 companies participated in the $50,000 cash awards in the third Machine Design Award Program sponsored by The James F. Lincoln Arc Welding Foundation, Cleveland.

First award of $10,000 went to Ernst Duesing, supervisor, Oliver Machinery Co., Grand Rapids, for his description of how a wood turning and metal spinning lathe was redesigned to make use of arc-welded components, thereby reducing the lathe's price by 35%.

Details of this machine's tubular-core bed which provides torsional rigidity, and the special fixtures devised to clamp components during welding, are presented in the accompanying article.

Second place winner was Fritz M. Hessemer, plant superintendent, Allis-Chalmers Mfg. Co., York, Pa. He received $7,500 for his analysis of the redesign of large hydraulic turbine runners from cast iron to arc-welded steel, at a cost savings of about 30%.

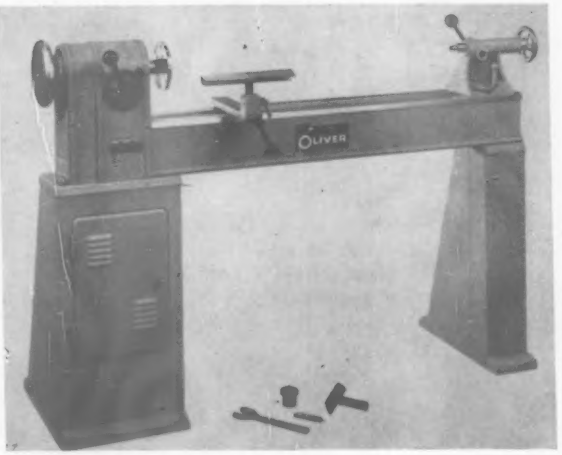
(This winning paper will appear in the next issue of *WE*.)

Some of the welded blades were a combination of stainless steel inserts welded to mild steel in those areas where cavitation danger is usually present.

Adolph H. Kleinsorge, chief engineer, W. B. Knight Machinery Co., St. Louis, received the $5,000 third place award for his review on the welding of steel surface plates. Conventionally made of cast iron or stone slab and used to check the flatness of machined parts, these welded plates proved lighter, less costly and more easily modified than former designs.

The $2,500 fourth place award was given to John K. Liu, associate director of research and development, Clearing Div., U. S. Industries, Inc., Chicago, for his description of the development of a new welded steel engine lathe. It is three times more rigid than the former cast iron design and was built at a 12% cost savings.

Fifty other awards ranged from $1,000 to $250 each.



COMPLETED 5-ft welded steel wood turning and metal spinning lathe has a trim, rugged appearance.

by **Ernst Duesing**
Oliver Machinery Co., Grand Rapids, Mich.

Welding cuts cost 35%, increases torsion rigidity on redesigned lathe

A COMPLEX WELDMENT may prove to be no better than the fixtures in which it is assembled.

In keeping with this reasoning, particular attention was paid to design and fabrication of welding fixtures for a redesigned 5 ft wood turning and metal spinning lathe introduced by Oliver Machinery Co.

Bed, headstock, tool rest and holder (and eventually the tailstock) are all of welded steel. The redesigning permitted a 35% price reduction along with a threefold increase in torsional rigidity.

(These lathes, used principally by schools and vocational training institutions, must be built to sell for about $500.)

In the new design, previous concepts of cast iron were discarded entirely. The bed, for example, has a central longitudinal structural member (or core) of 2¾-in. OD seamless steel tubing.

Slipped over and welded to the bed are seven 5/16-in punched plate cross members (or gussets) which carry the two hardened steel ways. The latter are ¾ by 2 in. cold rolled steel bars, welded to the gusset undersides. Bottom plates for bolting

Cost comparisons

Cast iron

Material: 156 lb @ $0.17	$26.52
Labor: planing, grinding, drilling, 2.764 hr @ $7.50	$20.73
	$47.25

Welded steel

Material: 102 lb at varying cost from $0.096 to $0.158	$13.65
Labor: 1.45 hr @ $7.50, including 0.65 hr for welding	$10.87
	$24.52

Weight savings—34.6%
Cost savings—48%

the bed to pedestal supports are welded under each end.

In assembling the bed, two requirements had to be met. First the ways had to be perfectly straight and equally spaced in two parallel vertical planes so that no machining of the four side-faces would be necessary. The horizontal top face of the rails could be easily surface ground at a moderate cost, so tolerance was not overly critical.

Easy placing of the various components into the fixture and ready removal of the welded bed was the second consideration. Actual welding time often is less than time spent placing and removing weldments.

The first fixture locates the seven crosspieces around the tubing. Care is taken to insure accurate spacing and to keep all gusset top surfaces in the same plane, although possible sidewise misalignment of the crosspiece is not important.

Gussets are fillet welded on both sides, but only on the two opposite, nearly vertical, faces of the tubing. By omitting top and bottom welds, possible distortion in the plane is minimized.

Sufficient strength is built into the all-welded fixtures to straighten the tube while being welded. Thus, it is possible to use standard tubing with commercial tolerance for straightness (1/16 in. per 5 ft length) without paying a premium for closer tolerance.

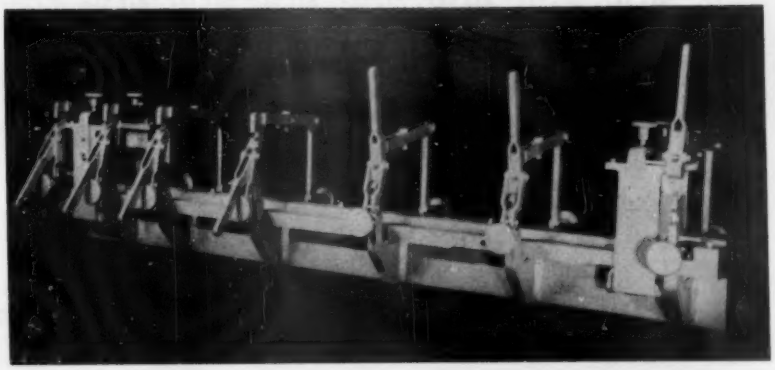
Only two knobs, located at the right end of the fixture, clamp all seven gussets against the vertical locating faces, while quick-acting toggle clamps straighten the tube and align the plates horizontally.

(The fixture is entirely of arc-welded standard hot and cold rolled steel shapes and rotates on trunnions to permit downhand welding.)

The first tube and gusset assembly is cooled, then placed in a second fixture for welding of the bottom plates and the two parallel top rails. Here, again, welding eliminates a costly machining operation.

Like most other cold rolled steel, the 3/4 by 2 in. material used for the top rails is seldom perfectly straight. Therefore, as in the first welding step, the fixture is used for straightening the bars.

Pressure is applied at seven points



FIRST welding fixture for assembly of gusset plates to tubular "spine" for the welded lathe bed.

SUBASSEMBLY of gussets and tubing made in the fixture shown above. Tubing is 2¾-in. OD, with ⅛-in. wall.

SECOND welding fixture is used for attaching bottom plates and two parallel top rails to the lathe bed.

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on each side to clamp the rails securely against a hardened and accurately ground spacing bar inserted in the welding fixture. The fixture's strength thus imparts its accuracy to the rails.

Rail distortion in the horizontal plane could probably have been counteracted by preforming the rails in the fixture. However, welding of the rails to the gussets causes a slight dip toward the welds.

And since an inexpensive grinding operation not only takes care of this deformity, but also enhances the top surface appearance, a slight unevenness is not objectionable. Height variation before grinding proved less than 0.010 in.

The ways are held perfectly straight and parallel to each other within 0.001 in. in their entire length, which is equal to, or better than, that obtained on a planed cast iron bed. Tests showed the bed to be considerably stronger and three times as resistant to torsion than its cast iron counterpart.

To enhance the bed appearance and to add overall lathe sales appeal, embossed panels of 16 gage steel are welded across each side. These are located with the aid of notches along the top edge, calling for accurate gusset spacing.

Although the panels contribute little to bed strength, they do conceal all internal welding, thereby eliminating weld cleaning.

Another welded component in the lathe is the headstock, consisting of an arc-welded assembly of standard steel shapes and low-cost stampings. The headstock is designed to provide variable spindle speeds of 600 to 3,600 rpm, changes being made through variable-pitch sheaves.

Eleven component pieces are welded to form the headstock, *i.e.*, spindle, ball bearings, pulleys, actuating arm, speed dial, shafts and cams, and an outer cover. Total cost is $15.45 compared to $27.50 for a cast iron design.

Arc welding was also used to fabricate tool rests and tool holder. Only four adjustable welding fixtures were required to weld all 24 styles and sizes. Cost of the welded tool rest was estimated at approximately 50% less than the former cast iron type.

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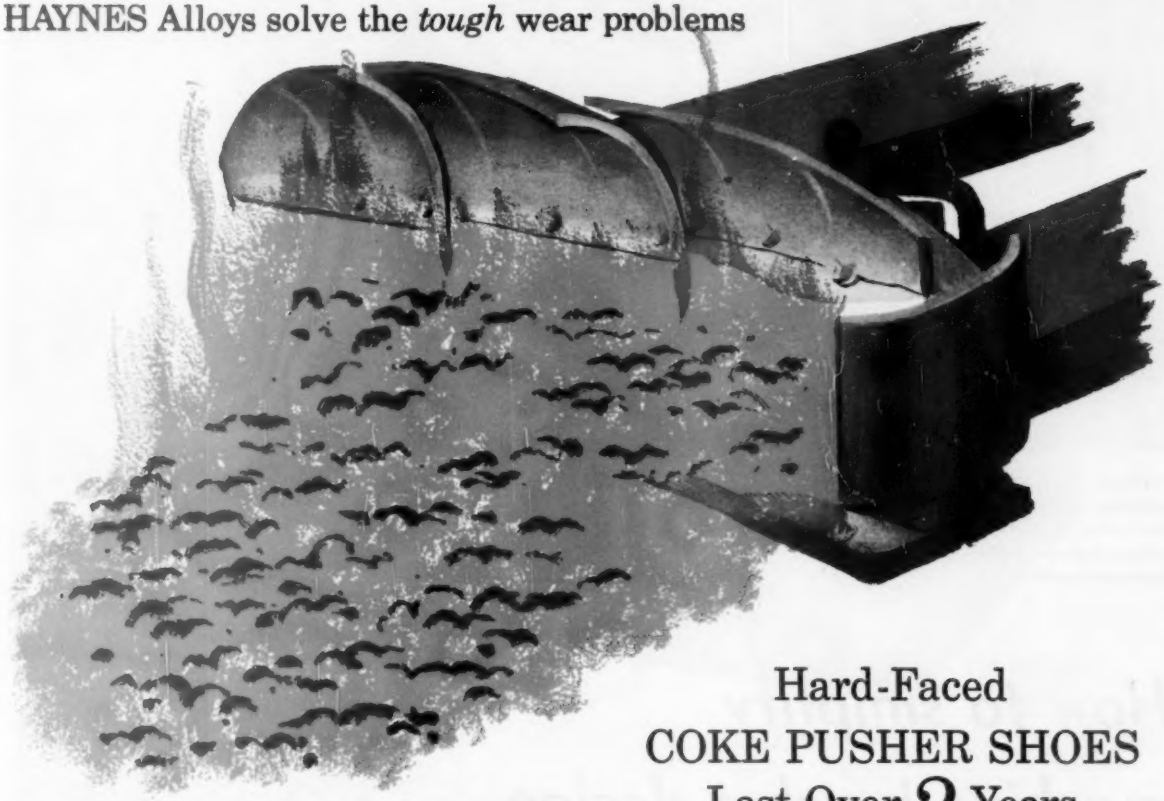

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Resisting severe abrasion, heat, and thermal shock produced by riding over the coke-covered floor of 1800-deg. F. ovens—these shoes hard-faced with HAYNES STELLITE alloy No. 1 lasted over two years. Ordinary steel shoes wore out in two months.

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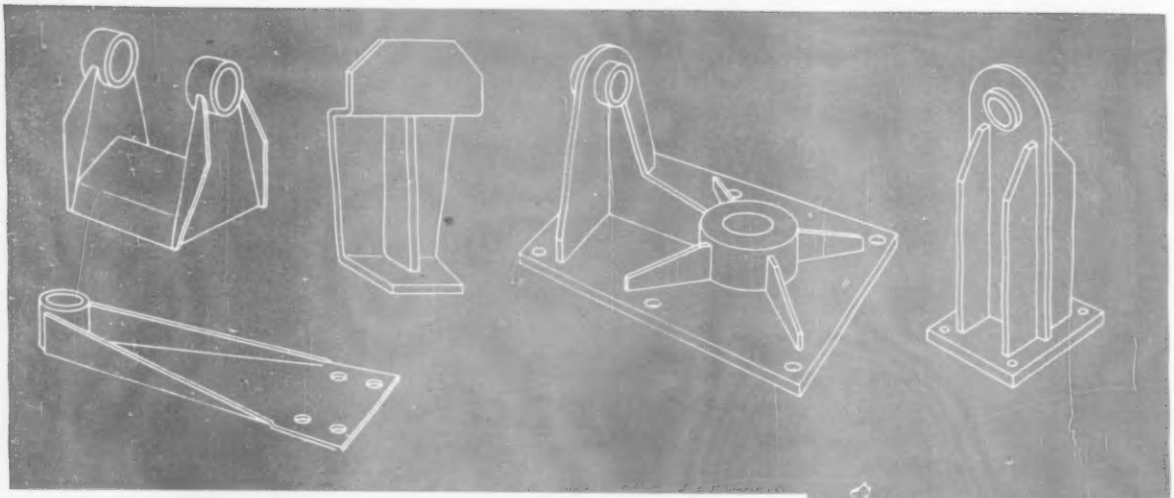


TYPICAL brackets can be welded from relatively thin steel, sheared, formed and tack-welded prior to finish welding, and utilizing high-speed fillet welds in the downhand position.

How to simplify machine bracket design

GREATER STRENGTH, less weight, and resulting lower costs—these are welding's three main advantages, and WELDING ENGINEER has promulgated them month after month.

However, if design engineers are not made to realize these advantages of welded design, then the ultimate 16 to 33% savings cannot be obtained. The key to lower manufacturing costs is welding.

For example, in the following design ideas, furnished by The Lincoln Electric Co., product weight and cost have been cut. The cost reduction is possible because steel is three times stronger, two and one-half times as rigid as cast iron; costs a third as much per pound.

Brackets, and similar components for positioning and supporting machine members, are relatively simple in construction, and redesign from cast iron to welded steel is easy.

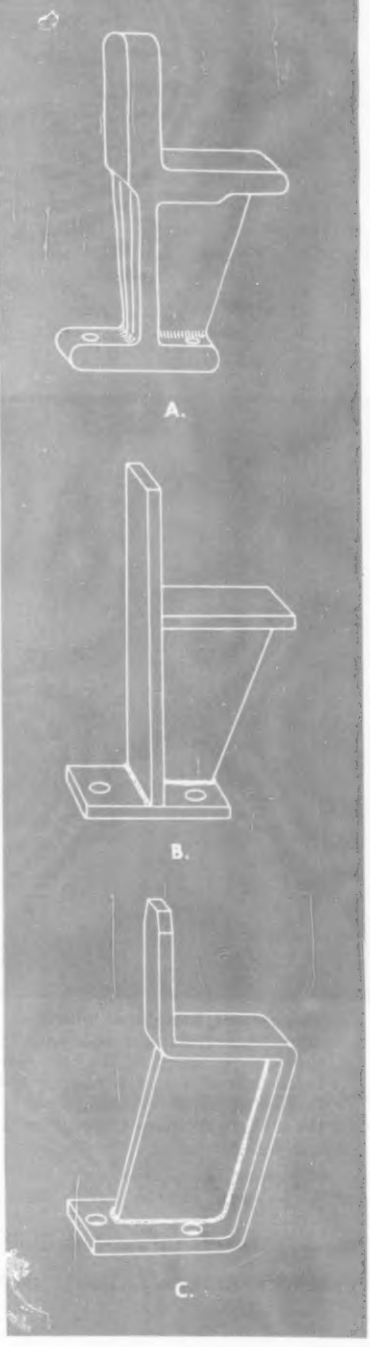
For equal strength, steel sections can be 25% the size of present cast iron sections; for equal rigidity, generally 50% of the thickness.

These savings hold true when design shape or geometry is followed closely and only the material is changed. However, with more efficient material use than possible with casting, products can use about one-fifth the original material needed.

With welded steel construction, component parts can often be sheared to shape (in other cases, bent to shape) reducing the amount of welding needed and cutting the manufacturing costs further. (Examples in figure I show different machine bracket types fabricated economically with arc welding.)

When redesigning a casting to welded steel construction, there is a tendency to adhere closely to the original cast-part shape, as mentioned above. However, the alert designer looks for other approaches.

With steel, design is not restricted by patterns and castings, *e.g.*, ex-



FIRST redesign of this cast bracket resulted in a 40% weight saving but fabrication costs almost equalled the material savings. In the second redesign, welding resulted in both a 40% weight savings and a 50% cost reduction.

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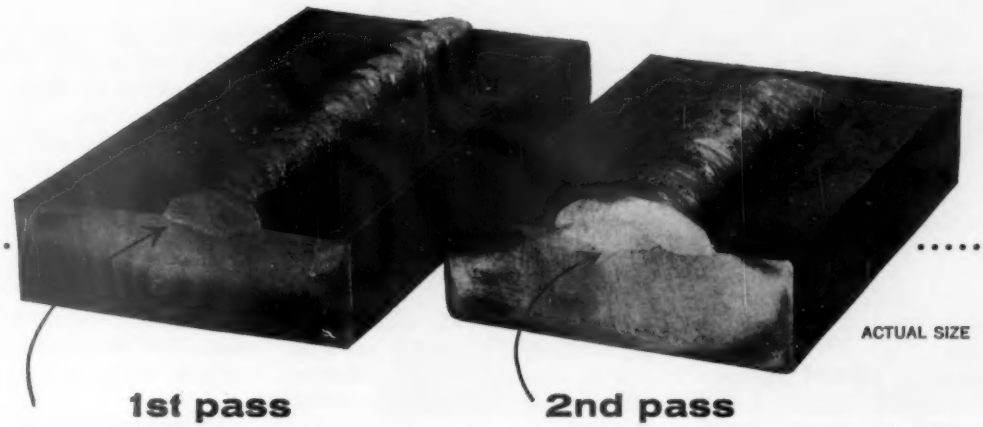

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tremely thin sections can be used. Materials can be placed to carry the greatest load with the least section, and every pound of metal can be put to use at its maximum physical ability.

The redesigned cast bracket in figure 2 (B), while maintaining the same shape as (A), weighs 40% less. This design is not efficient, however, and fabrication costs almost equal the savings.

A completely different approach (C) utilizes only two pieces of steel (bent, sheared and welded) representing a weight reduction of 40% and a cost-savings of about 50%.

Similarly, several different approaches can be taken in redesigning the cast-iron machinery bracket shown in figure 3.

In one redesign (figure 4) identical loads can be carried with half the section of the original. The bracket is simply a plate bent to shape, with a web added by fillet welding. In figure 5, two similar brackets serving the same need are flame-cut from a standard I-beam length.

To maintain necessary rigidity, the long bracket in figure 6 requires relatively heavy sections as a casting. When redesigned (figure 7), material thickness is reduced about 50%, duplicating the original shape.

A more efficient redesign, however, (figure 8) uses even lighter material bent to shape with two stiffeners welded across the bottom to prevent wobbling.

On larger size brackets such as figure 9, box sections or diagonal ribbing can be used for maximum structural rigidity at minimum weight. Where clearance is needed through the center, the box section is fabricated from two-side members, brake-formed to a "channel" shape (A). The two shapes are then butt-welded on opposite sides with fast downhand or automatic submerged-arc welding.

With diagonal ribbing, channel-shaped side sections are brake-formed to shape and steel strips welded to the insides, as shown in (B).

Figure 10 shows still another way a channel member can be used for a machine bracket. Sawed or flame-cut from standard structural shapes, the channel is fillet-welded to the top and side of the machine brackets.

Corner reinforcing can be done as shown in figure 11. Design (A) is for brackets requiring external support because of functional requirements, while (B) is for brackets requiring internal support.

Welded design with its use of less and lower-cost material points the way to increased product strength without increased costs.

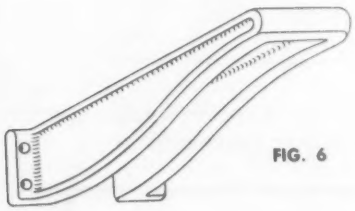

FIG. 6

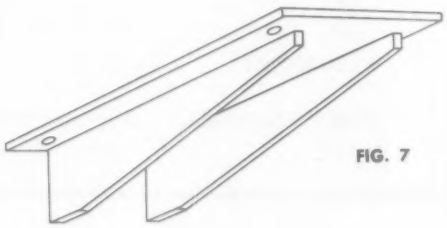

FIG. 7

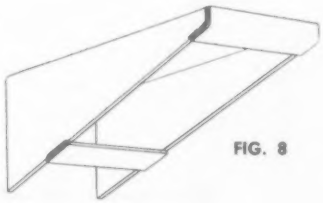

FIG. 8

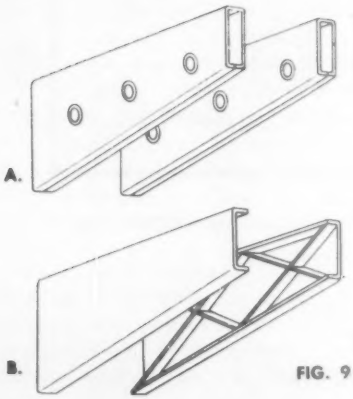

FIG. 9

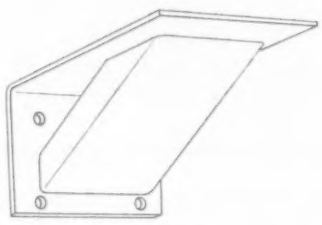

FIG. 10

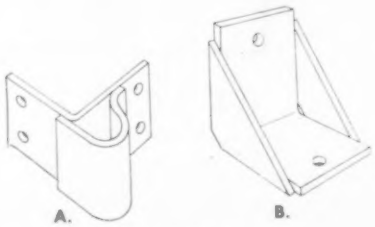

FIG. 11

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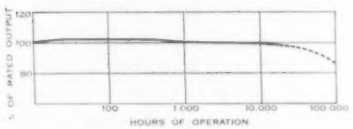

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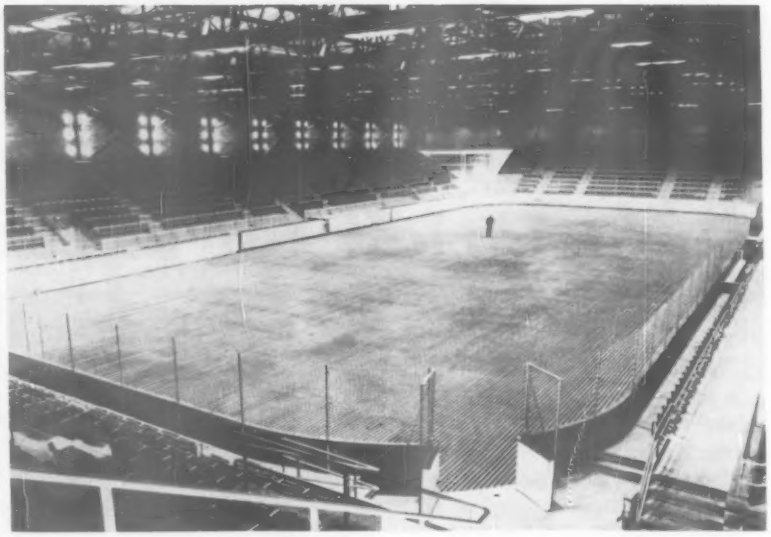

INSPECTION and tests after one season's service showed skating rink's piping system had no leaks or defects. Above is a view of the arena and the welded piping system before a 5-in. concrete slab was poured.

Welded pipe system for ice skating rink passes inspection

WHEN CONSTRUCTING ice skating rinks, the miles of pipe-coils are usually hydrostatically tested just before being embedded in concrete.

But engineers can seldom observe a rink's piping system performance during an entire winter season before permanently enclosing it. So when the opportunity recently presented itself, Jarvis Engineering Co., South Boston, Mass., capitalized on it.

The Central Maine Youth Center ice rink in Lewiston, Me., was constructed last fall and when the 1958-59 skating season was at hand, it was decided to open the center before the rink slab was poured.

More than 10½ miles of 1¼-in. standard steel pipe (produced by Jones & Laughlin Steel Corp.) was welded into hairpin design coils for the system. After being tested, the coils were covered with loose sand and the 85 by 200-ft rink area was flooded and frozen.

At the close of the season (last April), the sand was removed to expose the 56,000-ft of brine piping. This gave the firm a chance to inspect and test the system after an entire season's service.

The inspection showed no leaks or other defects had occurred; welds remained sound; there was no evidence of corrosion. Brine flow was well balanced.

Central Maine Youth Center is of concrete block construction with structural steel bow-string trusses supporting the roof which has a clear span of 160 ft. The interior stadium around the rink is built of structural steel framing with steel risers and concrete slabs.

Designed to seat 3,000, the arena is equipped with one of the largest portable floors in the country, making the facility adaptable for a wide variety of other sports, shows and meetings.

The rink piping system is positioned in a concrete slab with each pipe length supported by and wired to metal chairs. This allows the 5-in. finished concrete slab to envelop the pipes spaced on 4-in. centers. Supply and return headers are graduated using 3-in. to 8-in. pipes.

Argonne Laboratory studying metal embrittlement

RESEARCH HAS INDICATED that hydrogen atoms play an important role in causing many metals to become brittle and crack apart under stress.

Scientists at the Argonne National Laboratory, Lemont, Ill., are trying to find out what happens to hydrogen in metals, and why it reacts the way it does.

They have found that hydrogen will penetrate metals left exposed to the air for long periods of time. Once inside, hydrogen atoms bond with the larger metallic atoms. This bonding occurs because the orbital electrons of the respective atoms overlap each other, sharing the nuclei of two or more atoms.

Researchers say the bonds are not formed equally in all directions within the structure of a metal, and do not have equal strength. Hydrogen "pulls" metal atoms away from their neighbors, changing the original structure of the metal.

Since some of the bonds are stronger in one direction than another, metal has a tendency to "break off" when stress is applied along the edge of a bond.

Scientists ascribe embrittlement of metals to the directional nature of these bonds rather than to mechanical defects in metals such as pores, fissures, etc.

Neutron diffraction, a new technique, allows scientists to determine the positions of hydrogen atoms among metal atoms. A neutron beam streaming from the side of Argonne's Chicago Pile 5 heavy water research reactor is used.

Neutrons pass into a spectrometer for sorting and measuring of energies. They are bounced off a polished crystal, which selects a neutron beam of appropriate energy and sends it through a sample of metal.

When the beam goes through the metal, the diffraction patterns of the neutrons enable scientists to detect the relative positions of hydrogen and metal atoms.

The new technique is able to locate not only hydrogen atoms in respect to their metallic neighbors, but also other light atoms, including carbon, nitrogen and oxygen.

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New Ampco Cable Connector

WON'T OVERHEAT...WON'T ARC

Patented twin-wedge design can't work loose

Maintains perfect electrical contact — No lugs, locks, hooks, or springs to loosen and cause arcing. With twin-wedge connections, the area of tight electrical contact actually increases with normal wear!

Joins all cable sizes — Ampco Cable Connector fits all four popular welding-cable sizes. When properly attached by lead soldering or crimping, the cable connector can get no hotter than the cable itself.

Safe — When properly mated, Ampco Cable Connector withstands the tension stress applied by dragging cables over floor and up on positioners. Streamlined connector covers slide over or around obstacles without snagging. If improperly mated, the connector pulls apart before arcing can occur and cause damage.

Durable — Moulded Neoprene covers are not affected by oil, grease, high and low temperatures.

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W-154

Brazing cuts valve housing cost 40%

A STAINLESS steel servo-valve housing redesigned for furnace brazing resulted in a 40% savings over conventional machining from bar stock.

Because of necessary internal shoulders and flanges, machining from the solid was expensive, even where automatic techniques were used.

Redesigning of the part was done by Stainless Processing Div., Wall Colmonoy Corp., Detroit, and is now fabricated as a brazed body and cover assembly.

The body is produced on a screw machine from 347 stainless tubing; the cover, from stainless bar stock on an automatic screw machine.

To insure the best possible alignment, one with the other, the cover is a press fit in the body. The ring projection on the cover, which fits into the body, is serrated to provide space for the brazing alloy.

This technique insures optimum brazing joint clearance in the finished assembly since the serrations control clearance within a 0.002 to 0.003 in. range.

A nickel-base stainless type material suited to high-temperature applications is used. With this alloy applied and the two components pressed together, the unit is placed in a pure dry hydrogen furnace at 2,150 F. Bearing surfaces are machine finished after brazing.

GOLD STAR SR

This d-c rectifier type welder does more things better than any other welder of its class because —

a. Its new transformer (Miller designed and built) has integral flux diverter.
b. Its new weld stabilized circuit delivers the ultimate in speed of metal deposition.
c. Its new completely sealed semi-metallic rectifier — designed for welding — provides the most efficient d-c for welding ever devised.

These features contribute to the Gold Star SR's greater arc stability, denser welds, easy arc starting and flexibility to handle all electrodes in all positions.

Performance-proved wherever profits are important, the Gold Star SR is available in single and duplex models of 200 to 1200 amperes at 60% duty cycle ratings.

" . . . if it's MILLER
you know it's the finest . . ."

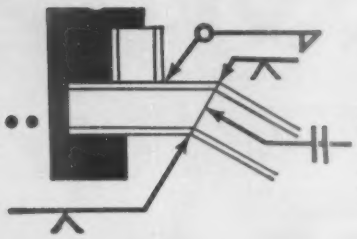
GOLD STAR *All-Weather* SRH

The features that set the SR above and beyond the normal standards of welder performance belong to the SRH also. But, in addition to the horizontal design for easier stacking and paralleling, this welder has an "all-weather" construction that includes baked varnish coated transformers and rectifiers plus phosphatizing and painting of all base and sheet metal — even fan blades. Cam-Lok receptacles are standard equipment. The Gold Star SRH welds real well.

Complete specifications on these Gold Star models will be sent promptly.

miller Electric Manufacturing Company, Inc., APPLETON, WISCONSIN

EXPORT OFFICE: 250 West 57th St., New York 19, N.Y. • Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal



the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Substituting low-alloy electrodes for low-hydrogen ones

Question:

When my work calls for a low-hydrogen electrode, I use either an Airco 394, 352 or 328. Can an Airco 94 electrode be used in place of the low-hydrogen electrodes, since it is a low-alloy electrode? And can it be used on Cor-Ten steel?

Answer:

The Airco 94, E7020-A1, electrode is recommended for making fillet welds in the flat and horizontal position, and butt welds in the flat, on carbon-molybdenum and Cor-Ten, Man-Ten and similar low-alloy steels. Hence, it can be substituted for the 328, E7016 if you are welding Cor-Ten in these positions.

In other cases, it might not be advisable to use it instead of the low-hydrogen electrodes. The low-hydrogen, iron-powder-coated 328 is recommended for welding hardenable steels where no preheat is used; high sulphur free machining steels; cold rolled steels normally exhibiting excessive porosity when welded with conventional mild-steel electrodes; and low-alloy or mild steel when normally required stress relieving cannot be done.

The Airco 394 (E10016) is also used on high-tensile steels, such as T-1, but it is in the 100,000 psi tensile strength class. Therefore, it is specially designed for high-strength deposits where lower strength low-hydrogen electrodes, like the Airco 328 which is in the 70,000 psi class, crack in the deposit. The 352 (E12015) is in an even higher strength class, being in the 120,000 psi range.

We believe manufacturers' recommendations should be followed, especially if both types of electrodes, low-hydrogen and low-alloy, are available, since they are designed for specific jobs.

Question:

I do considerable welding but the floor in my building is wooden. I was told there is a fireproofing compound in paste form for spreading on the floor. Could you tell me where this can be obtained?

Answer:

According to all available sources, including the National Safety Council, there is no fireproofing paste compound as described.

The Safety Council suggests installation of steel plates on the floor to prevent possible fire. The Council further states that it would be more economical to tin clad the floor with sheet metal.

There is a possibility that a non-combustible tarpaulin laid over the floor might prove adequate, but this would require considerable maintenance.

Question:

We use fixtures for aligning component parts for universal joints. The bearing and machined surfaces are exposed to weld spatter and flux compounds. Our replacement costs are mounting and we are running into misalignment problems because of excessive wear. Can you provide us with a possible solution?

Answer:

There are anti-spatter compounds available from your local welding supply distributor. When these are brushed on the surface of your fixtures, they should help prevent adhesion of weld spatter.

However, should these compounds prove unsatisfactory, we suggest either copper plating or chrome plating of the areas subjected to such adhesion.

Question:

How can I tell if my oxyacetylene cutting tip is clean?

Answer:

If the cutting valve is wide open and the proper oxygen pressure is being used, a clean cutting tip will emit a flame as much as 11 in. beyond the end of the tip, says Don Jones of Torrance, Calif.

He adds that the pale blue shaft of oxygen through the flame's center will be only twice as wide 8 or 9 in. from the end of the tip as it is at the tip.

Another clue to a clean tip is a soft, crackling sound originating near the end of the flame. A dirty tip will give a sound of escaping air at the flame's end.

To clean cutting tips, dress the end square with an auto point file and use drills or tip cleaners of the proper size.

ARE YOU A MULTI-BUNDLE BUYER?

Think of the poor fellow who buys a shirt from one store . . . a suit from another store . . . and a topcoat and a pair of shoes from still a third. His bundles grow; invoices, statements and receipts from so many sources multiply his paper work; and delivery dates are uncertain.

Liquid Carbonic eliminates multi-bundle buying in the welding field—by providing a full line: welding and cutting equipment, industrial gases, accessories for gas and arc welding and all other welding supplies. Our principle of single-source supply makes shopping easier, less expensive for you!

Have your Liquid Carbonic representative show you his "Case of Jewels"—a handsome display of precision-made Liquidweld torches and regulators. Ask him, too, about any Liquidweld equipment or supplies you may need.

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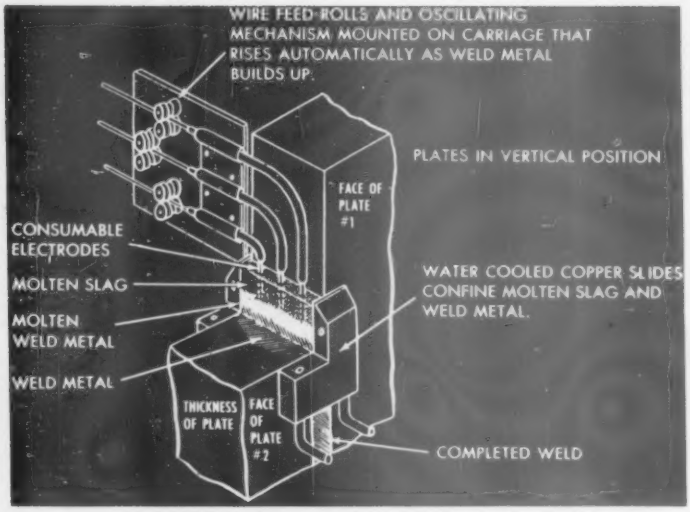
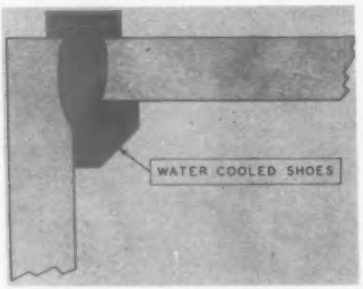

WIRE FEED ROLLS AND OSCILLATING MECHANISM MOUNTED ON CARRIAGE THAT RISES AUTOMATICALLY AS WELD METAL BUILDS UP.
PLATES IN VERTICAL POSITION
FACE OF PLATE #1
CONSUMABLE ELECTRODES
MOLTEN SLAG
MOLTEN WELD METAL
WELD METAL
WATER COOLED COPPER SLIDES CONFINE MOLTEN SLAG AND WELD METAL.
THICKNESS OF PLATE
FACE OF PLATE #2
COMPLETED WELD

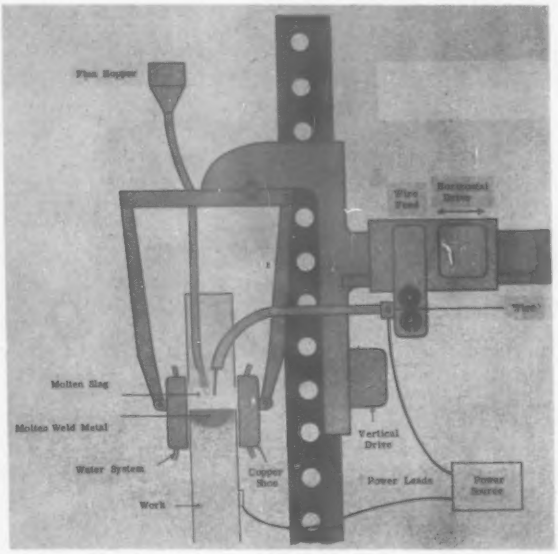
ELEMENTS of the electroslag welding process are shown in this illustration.



CORNER weld with inside fillet is shown above. Below, drawing shows essentials of the equipment.

During the '60s keep an eye on . . .

Electroslag welding of heavy sections



CONTINUOUS, ONE-PASS welding of heavy sections and elimination of elaborate joint preparation and slag removal are the two main advantages of the electroslag welding process.

It is an arc-less process in which an electric current flows through a pool of molten slag. The resistance of the slag to current creates a high heat, which melts both filler and parent metal to make a weld.

Such electroslag welding equipment, called Vertomatic, was recently introduced to the welding industry by Arcos Corp., Philadelphia.

Because the process is a single-pass operation and slag remains in a molten state throughout, there are no time-consuming interruptions for slag removal.

Joint types which can be welded include; butt, T-joints, corner welds with inside fillet and reinforcing surface welds. Longitudinal and girth seam butt welds in heavy walled vessels have also been made.

Since electroslag welding requires only a nominal 1-in. joint, it uses ⅓ to ½ less filler metal than the submerged-arc process for welding 6 to 12-in.-thick plate.

For a single electroslag electrode, deposition rate is 35 to 45 lb per hour. In very heavy plates for which three electrodes would be used, this results in 105 to 135 lb of filler deposited per hour.

Two kinds of wire may be used:

(1) A solid wire requiring a deoxidizing flux fed from a hopper as needed to maintain slag depth.

(2) A flux-cored or composite wire which has two advantages.

Because the flux is contained in the wire, it can be introduced more deeply into the molten slag. This deeper penetration contributes to better fluxing action. Another advantage is in the range of weld metal analyses that can be developed by introducing appropriate alloys through the flux.

Little or no flux is lost through spatter or evaporation, so the process consumes about 5 lb of flux for each 100 lb of weld metal.

There is no need for repositioning after welding has started, the usual rigger's handling equipment being adequate for most setups.

Design and construction of the electroslag equipment permits the machine to be moved to the work if necessary, even into the field.

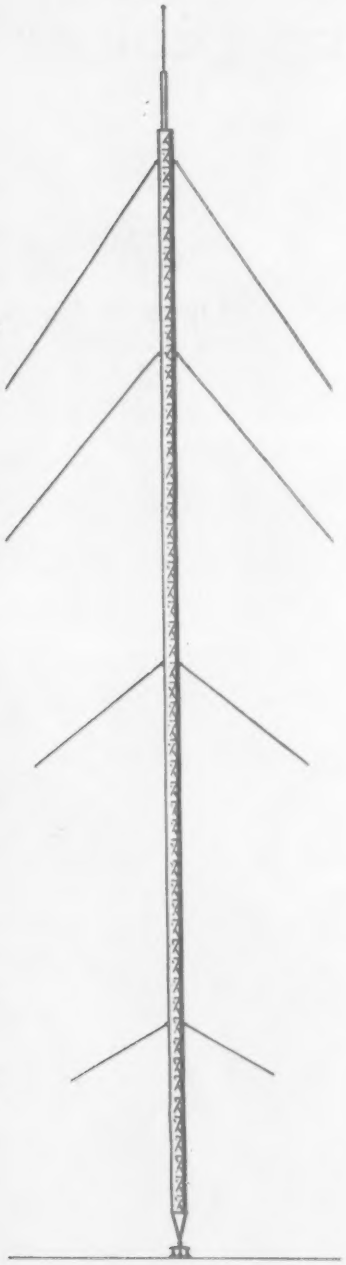
All operations are directed from a control panel and are normally automatic. Operation can be switched to what might be called manual in which the operator integrates the various movements.

World's champion corn picker welded with M&T Murex ELECTRODES

In the past eight years, five championships have been won by farmers using the New Idea corn picker. It is also the world's biggest selling brand. For the kind of welds that contribute to championship performance year after year, the New Idea Division of Avco Distributing Corporation depends on M&T Murex electrodes—products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

MUREX
PRODUCTS FOR BETTER WELDING

At Dresser-Ideco...



TALLEST man-made structure in the world, the television tower above, built by Dresser-Ideco for Oklahoma City's KWTV, stands 1,572 ft high, 100 ft taller than the Empire State Building.

by **F. T. Tancula**

Electronically-guided flame-cutter, arc welding build precision towers

MORE THAN HALF of all television towers in this country over 1,000 ft high bear the Dresser-Ideco Co. nameplate. They also bear the mark of precision flame-cutting and quality welding procedures.

A division of Dresser Industries, Inc., Dallas, Texas, Dresser-Ideco is headquartered in Columbus, Ohio, and from there sends tower components for erection to all parts of the country. Other Dresser-Ideco products include aircraft hangars, radio and radar towers, industrial buildings and structural steel sub-assemblies for conventional buildings.

Welding plays its usual vital role in the fabrication of most of these, but nowhere more dramatically than in the TV towers that seemingly reach for the heavens. Because of their nature, tower components do not readily lend themselves to automation, so welding operations at Dresser-Ideco are performed manually with stick electrodes.

This does not mean the firm spurns automatic processes—on the contrary, it owns and uses extensively a 10 by 20-ft automatic shape-cutter that is guided by an electronic tracer. Costly and bulky templates are no longer required when cutting intricate shapes, as the tracer can follow an ordinary pencil-line drawing.

E. T. Jones, plant engineer, says the machine is well on its way to paying for itself with the savings it helps achieve, and it is not yet one year old.

Except for a portable cutting outfit, Dresser-Ideco uses oxygen-natural gas for all flame-cutting operations.

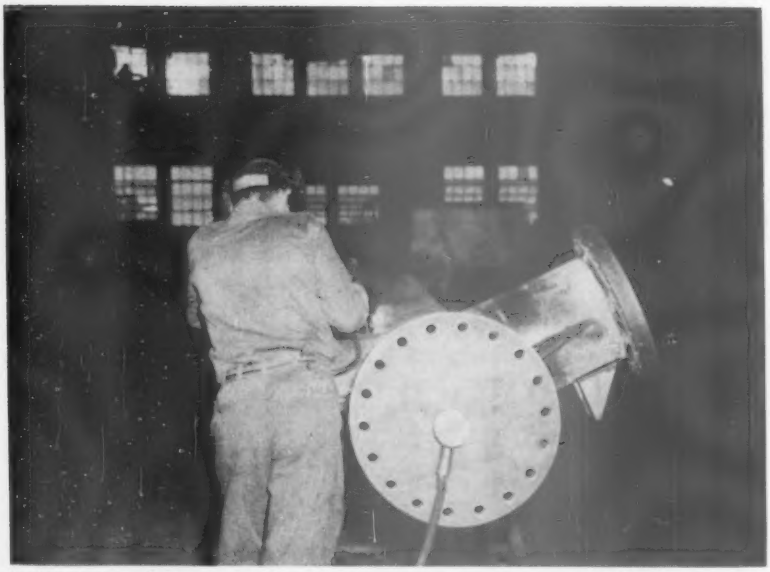
Most of the steel plate used by the firm is hot-rolled, ranging from

ELECTRONIC tracer helps this new flame-cutting machine cut intricate shapes without need for costly templates. Here, however, it is cutting only a straight line in an I-beam.

World's thirstiest flood pumps welded with M&T Murex ELECTRODES

Some of the biggest pumps in the world are controlling flood damage in Florida's Lake Okeechobee area. With intake pipes 12 feet in diameter, they suck up swimming pool sized gulps of flood waters every second, spew it out into a series of reservoirs. Though not yet complete, the system has already prevented an estimated $44-million damage. The thirteen Fairbanks-Morse pumps in use were welded with M&T Murex electrodes—products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

MUREX
PRODUCTS FOR BETTER WELDING



HEAVIER (lower) leg section of radar tower has connecting arms welded to it. Flange at right will be bolted to similarly flanged horizontal member in the field.

10 gage to 6 in. in thickness. Both the plate and many structural shapes needed for fabricating the products are cut on the electronically-guided machine, as well as on a smaller, manually-guided unit.

In welding, D-I uses primarily two types of electrodes—E6012 and E6024, though some applications require use of E7016 low-hydrogen electrodes. Both the E6012 and the E6024 are a-c or d-c electrodes, and the latter has a heavy iron-powder coating.

Most popular diameter sizes are 3/16 and 7/32 in., but 5/32 is also sometimes employed. The normal average consumption of these filler metals is 5,000 lb per month; however, when *WE* visited the plant in June, the shop was consuming the electrodes at the rate of 12,000 lb per month.

Since TV and radio antenna towers are subjected to atmospheric conditions of all descriptions, the Columbus plant has its own hot-dip galvanizing department.

By coating against corrosion *after* welding, Dresser-Ideco eliminates the usual problems encountered when welding galvanic-coated components. About 40% of the products turned out by the Columbus facility are galvanized within the firm's own department.

One hot-dip tank, for example, is sufficiently large to accommodate an 11,000-lb, 30 ft tower section.

Although by far the greatest majority of the firm's towers are fabricated from mild steel, they have built two from T-1 steel. The first tower order in the country incorporating the high-strength alloy steel was awarded to the firm early in 1956 by station WBZ in Boston.

To cite the rugged construction of its towers, Dresser-Ideco proudly points to Mt. Wilson, 5,900 ft above Los Angeles, where its towers serve five television stations. In winter, loaded with ice and hammered repeatedly by gale-force winds, the towers have absorbed some of the roughest punishment asked of any structure.

The Columbus plant's 40 weldors are also called upon to fabricate structural sub-assemblies for industrial buildings and hangars. The Dresser-Ideco rigid-frame building has welded arch frames; bowstring and mill building columns are wide-flange beams with angle knee braces. Trusses for these and for flat-roof buildings are constructed with structural shapes and are shop welded to maximum sizes possible within shipping limitations.

The four basic framing plans come in a wide range of spans and wall heights. In addition, these buildings can be built according to customer specification.

There is some assembly-line production at Dresser-Ideco, but for the most part, the variety and nature of its products make the Columbus plant more like a large custom job shop.

And like most job shops, this one gives a great deal of credit to welding. "It takes welding to develop the finished product, and we couldn't do without it," says Plant Engineer Jones.

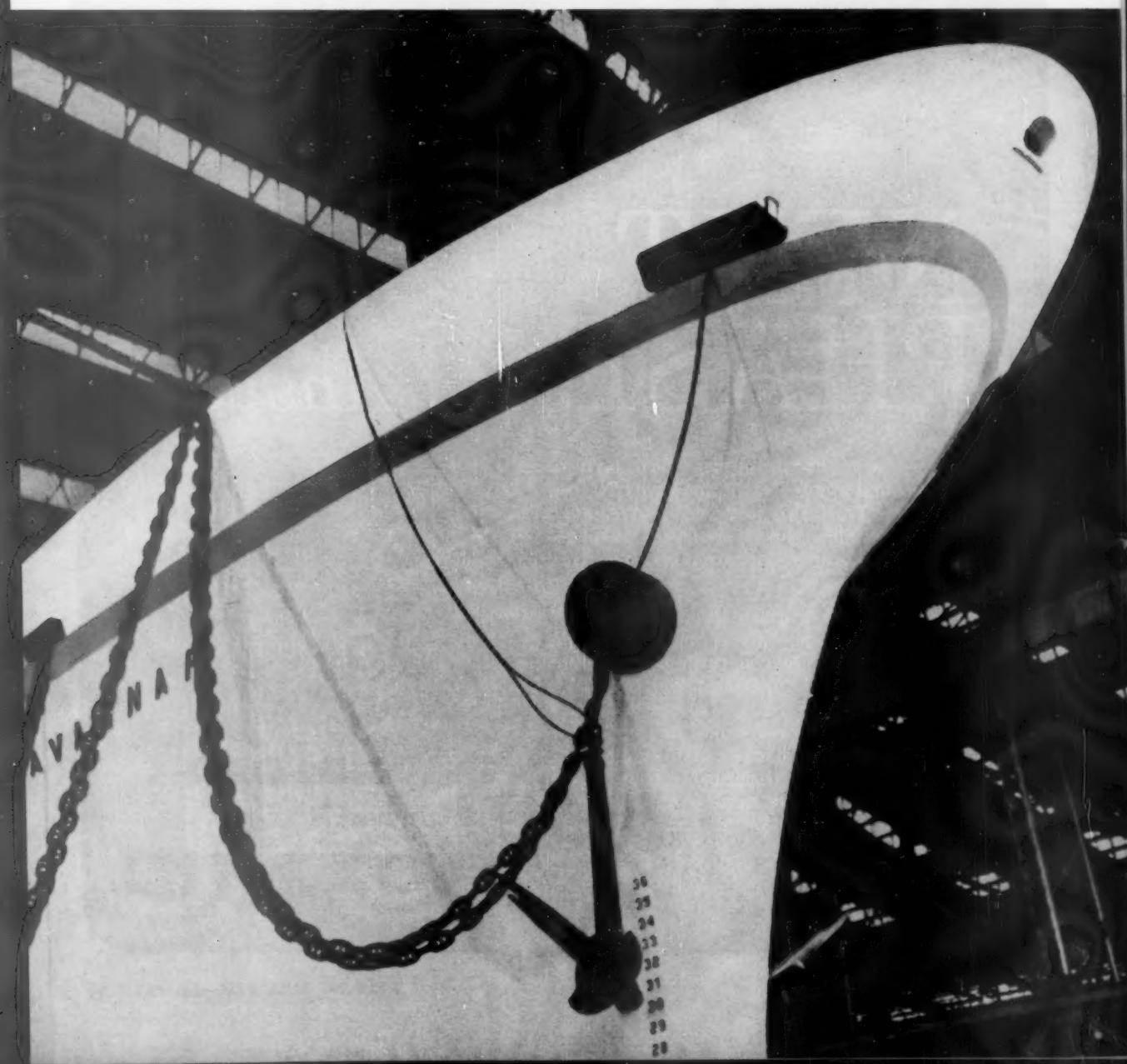
SMALLER hot-dip tank is used to galvanize tower component. About 40% of Dresser-Ideco products are coated against corrosion in this department after welding, thus eliminating the usual problems of welding galvanic-coated parts.

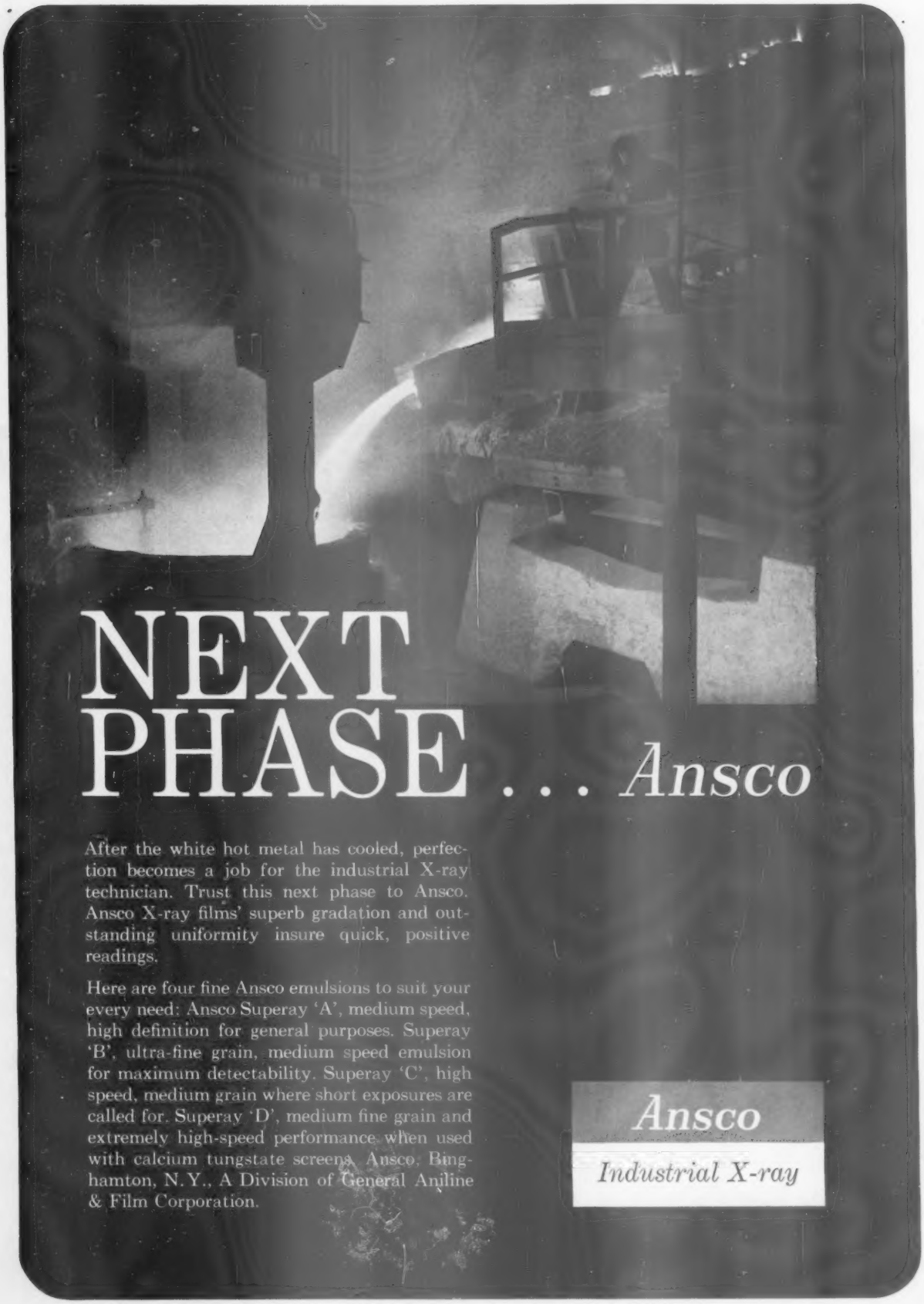
INTERMITTENT welds are made on structural member for one of Dresser-Ideco's buildings. Engineering specifications, noting sufficient strength of this type of joining, did not call for continuous welds, which would only be overwelding.

World's first atomic cargo ship relies on M&T Murex ELECTRODES

The N.S. Savannah, world's first nuclear-powered merchant vessel, is designed to prove the feasibility of "Atoms for Peace." Scheduled for initial service in the summer of 1960, she will cruise at 21 knots with a cargo of 10,000 tons, a 110-man crew and 60 passengers. In constructing the safety container for the atomic reactor, heart of the vessel's power system, the New York Shipbuilding Corp. relied upon Murex electrodes—products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

MUREX
PRODUCTS FOR BETTER WELDING





NEXT PHASE . . . *Ansco*

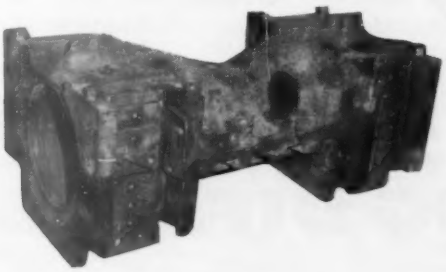
After the white hot metal has cooled, perfection becomes a job for the industrial X-ray technician. Trust this next phase to Ansco. Ansco X-ray films' superb gradation and outstanding uniformity insure quick, positive readings.

Here are four fine Ansco emulsions to suit your every need: Ansco Superay 'A', medium speed, high definition for general purposes. Superay 'B', ultra-fine grain, medium speed emulsion for maximum detectability. Superay 'C', high speed, medium grain where short exposures are called for. Superay 'D', medium fine grain and extremely high-speed performance when used with calcium tungstate screens. Ansco, Binghamton, N.Y., A Division of General Aniline & Film Corporation.

Ansco

Industrial X-ray

WELDOR prepares to remove securing welds on a worn bearing box wear plate. Six plug welds and five fillet welds are marked with chalk. At right, fillet welds are being gouged out. Torch can be used on vertical plane as well as on horizontal. Below, locomotive bearing box with new wear plates are again ready for service.



Arc-air slices costs of locomotive repairs

THE FORWARD MOTION of the railroad industry is being accelerated by an arc-air torch which has helped slash maintenance time on roller bearing housings by 80%.

The New York, Chicago and St. Louis Railroad has been using Arcair Co. equipment for eight years. It is used in the welding departments of the locomotive repair shops to cut away the stainless steel welds which secure hardened steel wear plates on roller housings.

Before, the stainless welds were cracked with a heavy chisel. Then, a wedge was forced under the edge of the hardened plate to break it away from the housing. This method endangered the men needed for the operation. Many times when driving a wedge under the brittle steel, pieces broke off, shooting through the air with the velocity of a shell shrapnel. A mashed finger now and then was another hazard.

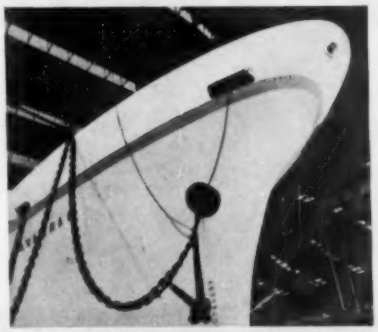
Still another great disadvantage of the method was the heavy grinding needed to clear away welds.

Now, by using the arc-air process with a 3/8-in. copperclad electrode which is partially consumed, one man can do the job in one-fifth the time formerly needed. A 600-amp motor-generator set powers the operation with 425-amp. Compressed air of 110 psi is provided from the shop line. The job moves along so fast, housings do not even get hot.

It takes only minutes for a weldor to slice away the 10 fillet welds and six plug welds used on a housing. Then, a few swats with a hammer and the worn plate drops off. Only a quick finish grinding job follows.

Corn Picker

Flood Pumps



Nuclear Ship

...where you find companies that take great pride in the superiorities of their product, you'll generally also find great reliance on Murex welding electrodes.

Murex electrodes comprise one of the broadest lines of quality rods and wire. Choose from over 1000 types and sizes—mild steel and low alloy, stainless, hard surfacing, etc. Ask the M&T man or send for free literature. Also for information on M&T's complete line of welding machines.

M&T welding products

METAL & THERMIT CORPORATION
General Offices • Rahway, New Jersey

PROGRESS IS NEVER A

To the Welding Industry...

EUTECTIC RESEARCH MAKES THE BIG DIFFERENCE

IN OUR 20th YEAR OF

World Headquarters
Flushing, New York

MATTER OF CHANCE

Real progress doesn't "just happen". It must be carefully and deliberately *created!* It requires dedication and a relentless desire to make things better than they are.

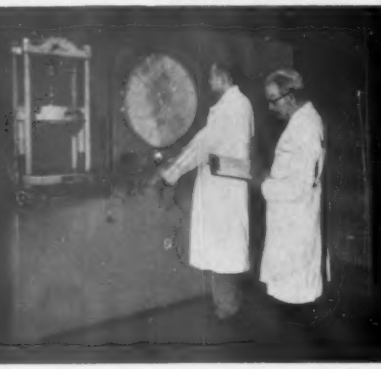
Ceaseless research has been the key to EUTECTIC progress since its inception 20 years ago. It began with the discovery of the "Surface Alloying" principle and the development of the exclusive Low Heat Input Welding Process – and has continued through the development of the more than 160 EUTECTIC "Low Temperature Welding Alloys"®, Fluxes and Welding Aids. The purpose has always been the same: to develop better methods of providing faster, easier and stronger welds... *while minimizing stresses, embrittlement, distortion and warpage created by conventional high heat methods.*

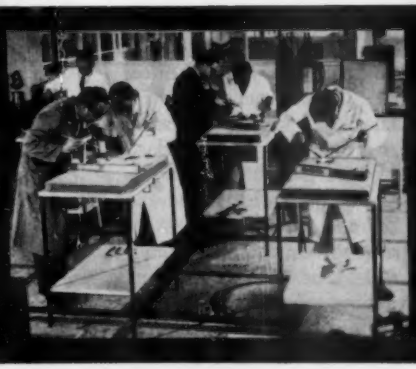
Today, these efforts are still going on – more than ever before! Every year finds new plants... new laboratories... new equipment being added to our already extensive facilities throughout the world. Soon, a vast new Foundry and Metallurgical Center will be completed – heralding the start of the most ambitious research and development program ever undertaken by this or any other company in the field.

Progress, based on research, is the primary aim at EUTECTIC. And progress *to us* means better products, improved techniques, and greater service *for you.*

NEW FOUNDRY AND METALLURGICAL DIVISION being constructed will house complete facilities for metallurgical research and developments, as well as the actual production of core wires from virgin metal.

PROGRESS AND SERVICE





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CANADIAN PLANT AND HEADQUARTERS: MONTREAL
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Wear-O-Matic Hard Surfacing is 3 Ways Better

1 *Faster . . . More Economical*

The Wear-O-Matic process of semi-automatic hard surfacing is continuous welding with manual control of the arc. However, unlike manual welding with stick electrodes, there is no time consuming slag cleaning or electrode changes. Higher deposition rates, 3 to 5 times faster than stick electrodes, greater deposition efficiency, 85 to 95%, plus more available arc time add up to savings of 40 to 50% over manual hard surfacing with stick electrodes.

2 *Uniform Resistance to Wear*

The superior wear resistance qualities of Wear-O-Matic hard surfacing wires is the result of closely controlled manufacture, properly balanced alloys and fluxing agents, and precision drawing. Wear-O-Matic 7/64″ diameter open arc wires are precision drawn to true wire diameter ± 0.002″ and through drawing are densely compacted assuring an easier feeding wire that will not crush in the feed rolls or bind in the feed cable. Dense compaction and closely controlled fabrication combine to provide a weld deposit more uniform in chemistry and metallurgy resulting in uniform hardness and greater wear resistance throughout the deposit.

3 *Greater Efficiency and Ease of Application*

Here's a hard surfacing combination *designed* to cut maintenance cost through the *profitable* utilization of your welder's time. Wear-O-Matic wires in WELD-PAKS are the key to greater efficiency of both semi-automatic equipment and operator. Each WELD-PAK contains 100 pounds of wire packaged in a "dead cast" resulting in tension free, snarl free feeding. Because the WELD-PAK contains 2 to 4 times more wire than standard coils, the amount of time spent handling wire is lessened, providing more time for welding. WELD-PAKS are easier to handle and store; and on the job, the lid can be replaced after use assuring dirt and dust free wire when you are ready to resume welding. From set-up to finished job, the Wear-O-Matic process is easier and faster, eliminating overtime or providing more time for other maintenance jobs. Job test this time saving process in your own shop. Request Bulletin HS-102 for complete details. Alloy Rods Company, P. O. Box 1828, York, Pennsylvania.

Wear-O-Matic Wire Feed Unit
$279.00 f.o.b. York, Penna.
or El Segundo, Calif.

Weld-Pak is the trade name for this exclusive Wear-O-Matic package.

Alloy Rods Company

YORK, PENNSYLVANIA • EL SEGUNDO, CALIFORNIA

QUALITY WELDING ELECTRODES FOR

Stainless Steel
Low Alloy Steels
Cast Iron
Tool Steel
Bronzes & Dissimilar Metals
Hard Surfacing Electrodes & Wires

NO FINER ELECTRODES MADE . . . ANYWHERE

Welding Tip Numbers Compared to Drill Size of Orifice

Tradename	Series	80	79 78	77 76	75 74	73 72	71 70	69 68	67 66	65 64	63 62	61 60	59 58	57 56	55 54	53 52	51 50	49 48
Airco	All			00		0		1			2			3	4		5	6
Canadian Liquid Air	All			00		0		1			2			3	4		5	
Craftsman	AA					0	1				2		3		3	4		
	W					1				2								
Dockson	4EC, 4SC, 7SC, 3EC, 5EC, 6EC, 7EC		1		2				3				4		5		6	7
Gasweld	G25, G35				00	0	1		2				3		4 5		6	7
	G55	00	0		1		2						3		4 5		6	
	AVG	00	0		1		2				4	5			6		7	8
Harris	2890-F						00				0			1		2		
	6290								00	0				1			2	
	7490-A										00	0		1	2			3
K-G	AP, APM, APL			00		0		1			2			3	4		5[1]	6
Liquidweld	90			000			00			0		1		2		3	4	
	70, 72, 80, 82						00			0		1		2		3	4	
Marquette	A			00			0		1		2		3		4		5	
	H		00	0		1		2			3			4	5		6	7
	F				00		0	1		2			3		4	5		6
	G						0		1		2			3	4		5	6
	H & J		00	0		1		2			3			4	5		6	
Meco	All	00		0			1			2			3		4		5	
National	B		00	0	1		2	3		4		5		6	7		9	10 11
	G, P			0		1			2						3		4	
	R			000			00			0		1			2 3			
Oxweld	W-15				1			2			3			4	5		6	7
	W-29				1		2			4				6	9	12		15
	W-17, W-22, W-26									4				6	9	12		15 20
	W-45, W-47				2						4		6		9 12	15		20
Powr-Craft (Montgomery Ward)	84-5881								1				3		5			7
Prest-O-Lite	420			2								6				15		20
Prest-O-Weld	W-109			1				2				3		4		5		6
	W-110, W-111			1			2	3			4		5		6[2]	7		8
	W-120		1		2					4			6		9 12	15		20
	W-121, W-122				2					4			6		9 12	15		20
Purox	33	0		1				2				3		4		5		6
	34					1			2						4			6
	35					1			2				3			5		
	W-200		1		2					4			6		9 12	15		20
	W-201, W-202				2					4			6		9 12	15		20
	00-D			1				2				3		4	5			
Rego	GX, GXU, SX					72		68				62		58		55	53	50
Smith	Pipeliner MW[3]						101 102		103		104			105	106 107		108	109
	Airline AW[3]		000	00	100		101 102		103		104			105	106 107		108	109
	Silver Star LW[3]						101 102		103		104			105	106 107		108	109
	LW[4]						700				701		702		703		704	705
Torchweld	GP 570, 870					72		68				62		58		55	53	50
	370, 170		79	76		72		68				62		58		55	53	50
	71			76		72		68				62		58		55	53	50
Victor	All			000		000½	00		00½	0	0½	1		1½	2	2½	3	3½ 4
Weldit	All		00	0			1			2				3	4		5	6 7

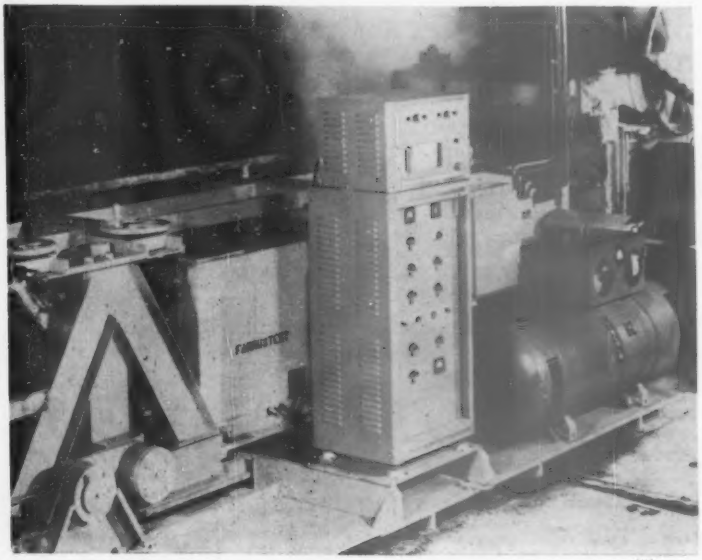
Tradename	Series	47 A″ 46	45 43 44	42 41 40	39 38 37	36 35 34	33 32 31	1/8 30 29	28 27 26	25 24 23	22 21 20	19 18 17
Airco	All		7	8		9		10		11	12[9]	
Canadian Liquid Air	All	6		7	8		9	10		11	12	
Craftsman	AA			5	6		7[6]	8				
Dockson	All		4			5	6		7 8			
Gasweld	G25, G35		8	9 10	11	12 13	14 15	16				
	G55		8									
Harris	13, 14, 16, 17, 50		8 9	10								
	23, 13-F, 23A Swedged	8	9	10			12	15[7]	19	22		
	17-F Swedged											
K-G	AP, APM, APL		7	8[8]		9		10[9]				
Liquidweld	90		5			6		7 8	9 10 11	12		
	70, 72		5			6		7 8	9 10 11			
	80, 80		5			6		7 8				
Marquette	A	6	7	8		9	10	11	12	14		
	F		7	8		9	10	11	12	14		
	G			8		9	10					
Meco	A, A1	6		7		8		9	10		11	12
National	B		12	13		14	15					
	G	5		6								
	P	5		6	7	8	9	10				
	R	4	5				6	7 8	9 10 11	12		
Oxweld	W-29	20		30								
	W-17, W-22, W-26		30	40				55 70	100	90	125	150
	W-45, W-47		30	40			55	70	85	100	125	150
Powr-Craft (Montgomery Ward)	84-5881		9									
Prest-O-Lite	420		30									
Prest-O-Weld	W-109	7	8									
	W-110, W-111		9	10		11	12	29				
	W-120		30									
	W-121, W-122		30	40			55	70	85	100		
Purox	33	7	8									
	34		8			10						
	35	7			9		11	13				
	W-200		30									
	W-201, W-202		30	40			55	70	85	100		
Rego	GX, GXU, SX	46[10]		42		36	31[11]			25	20	
Smith	Pipeliner MW[3]		110	111		112						
	Airline AW[3]		110									
	Silver Star LW[3]		110	111		112		113				
	LW[4]		706	707		708	709		710 711	712		
Torchweld	GP 570, 870	46		42		36	31[12]			25	20	
	370, 170, 71	46		42		36						
Victor	All		5			6		7 8	9 10 11	12		
Weldit	All		8 9	10	11	12	14	16				

[1] *APL to No. 5 only.* [2] *W-110 to No. 6 Tip only.* [3] *Soft-flame tip.* [4] *Heavy-duty Tip.* [5] *Airco Tip No. 13—Drill Size No. 10; No. 14—Drill No. 2; No. 15—¼-in. Drill.* [6] *Tips No. 7 and 8 require special gooseneck.* [7] *13-F and 17-F Swedged to No. 15 Tip only.* [8] *APM to No. 8 Tip only.* [9] *AP to No. 10 only.* [10] *SX to No. 46 Tip only.* [11] *GXU to No. 31 only.* [12] *GP 570 to No. 31 only.*

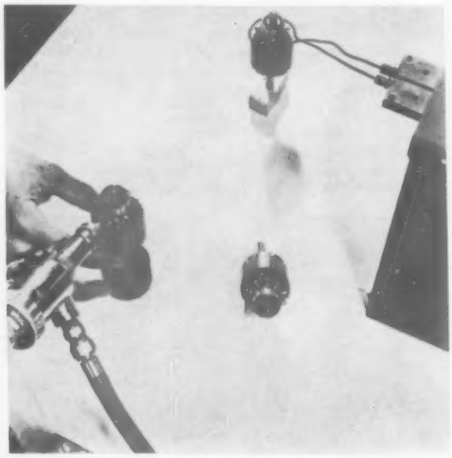
OIL drilling crews and supplies are being carried safely to many offshore rigs in the Gulf of Mexico and foreign waters aboard sturdy work boats made of corrosion-resistant steel supplied by Jones & Laughlin Steel Corp., Pittsburgh. Boats are made by Breaux's Bay Craft Boats Inc., Loreauville, La. Ten-gage sheets are used for hull plating while deck plates and cabin walls are made from 13-gage sheet. Hull plates (picture) are applied to cross and longitudinal ribs that are cold formed from hot rolled strip, and then spot welded at points of contact. Continuous welding is used throughout seams where plating joins. After plating has been applied to skeleton framework, it is torch-heated to relieve stresses that may have developed.

AS the nuclear powered S. S. *Seadragon* slid down the ways at Portsmouth Naval Shipyard, Portsmouth, N. H., crews were already preparing to work on another atomic sub. But before they could get started the old ways had to be removed. Two Linde Co. powder lances did the job. A mixture is burned in a stream of high purity oxygen creating an intensely hot reaction that melts both ferrous and non-ferrous material. Oxygen and powder are mixed and carried to the cut in lengths of consumable black iron pipe. Lances cut the ways into 22 sections of 30 tons each. A total of 29,275 lb of special mixture—85% iron and 15% aluminum powder—was used, plus 540,000 cu ft of oxygen and 8,000 ft of ⅜-in. pipe. Hood is over cut to remove non-toxic smoke from reaction.

On the job...



FARROWTEST, a non-destructive test for electronic detection of invisible flaws in steel line pipe, is produced by Republic Steel Corp., Cleveland. Employing a system of eddy currents induced in pipe, test uncovers injurious defects which might prove hazardous under service conditions. Any interruption in current flow signals a break in pipe continuity. Farrowtesting rejects pipe containing harmful flaws yet passes non-harmful variations. Machine induces current along general weld area of each pipe section yet is sensitive enough to detect flaws on pipe's opposite side.



A solder incorporating both a flux and solder in a stable paste form has helped an electric motor manufacturer reduce soldering costs of armatures 370%. Each of 12 eyelets is dabbed with some paste (picture) and the armature then placed in the coil of a table model induction heater to melt and flow the solder. Time required under the new set-up is 9 seconds, former time was one minute. A material savings of 12% is realized. Paste is supplied by Fusion Engineering Co., Cleveland.

Page Welding Wire

CUTS COSTS FOR TRACK SERVICE COMPANY...

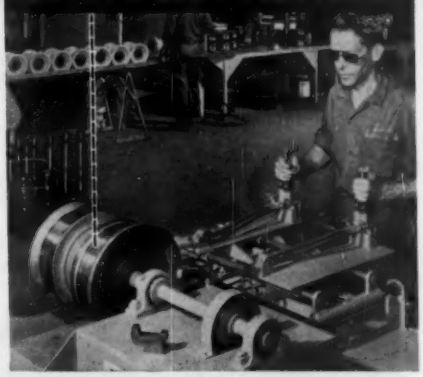
Provides Fast, Economical Build-up of Tractor Rollers

• Two PAGE welding wires have helped Track Service Company of Oklahoma City develop a new method of building up the roller bearings and flanges of tractor rollers. As seen in the section of a flange above, the finished build-up has a smooth machine finish with uniform Rockwell hardness.

The running surface, or bearing, is built up by automatic welding with PAGE analysis A-S-6150—the flanges with A-S-65. Both of these welding wires are machineable as welded, making it easy to machine the welded roller to finished dimensions. At this point, the Rockwell hardness of the flange is C-25, with a hardness on the running surface of C-40/50.

The flanges are then heated to 1500°F and immediately water-quenched, giving a non-spalling surface of about Rockwell C-55 and shading down to Rockwell C-40 at the base metal.

This build-up method is fast—and far less costly than the usual tubular alloys. It's also a good example of the versatility afforded by the wide selection of PAGE welding wires.



Flame hardening of flanges is done on this machine designed by Track Service Company. Top illustration shows cross-section of hardened flange.

Let PAGE Help Solve Your Welding Problems

These Folders can help you

Write for:

Folder DH-402-C Contains information on submerged arc and inert gas automatic welding wire. Lists descriptions and uses of the many PAGE analyses. Describes our extensive variety of packaging. Illustrated.

Folder DH-1218 • Chart lists detailed analyses of PAGE automatic welding wires, metal spray wires, bare electrodes and gas welding rods. Shows uses and physical properties. Lists most competitive makes.

When you bring your welding problems to PAGE, you get the benefit of over half a century of wire drawing experience and leadership in metallurgical research. Leadership evidenced by the industry's widest range of analyses—33 grades designed to do an endless variety of welding jobs. Let PAGE help you improve your quality and lower your costs by furnishing the right wire for your job.

PAGE wire packaging is designed to give you the utmost in convenient storage and handling, whether you require a 1# spool or a 1200# payoff-pallet. Prompt delivery is assured from a coast-to-coast network of PAGE distributors backed up by strategically located PAGE warehouses.

You will find it is "good business" to bring your problems to PAGE.

ACCO

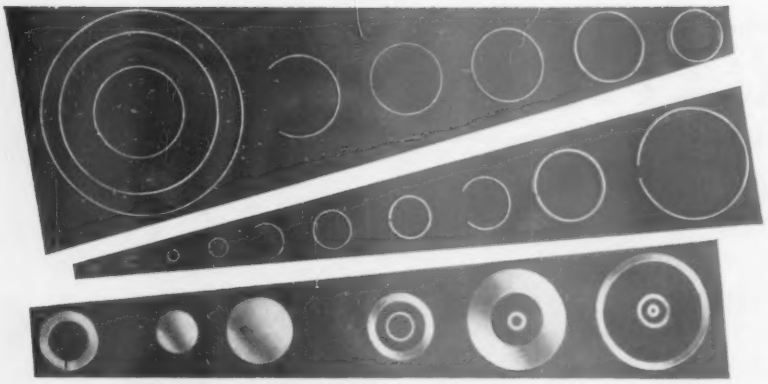
PAGE WELDING WIRE

Page Steel and Wire Division • American Chain & Cable Company, Inc.

Monessen, Pa.*, Atlanta, Chicago*, Denver*, Detroit, Houston*, Los Angeles*, New York, Philadelphia*, Portland, Ore., San Francisco*, Bridgeport, Conn.

*Indicates PAGE warehouse stocks

PAGE—THE SOURCE FOR ANSWERS TO WELDING PROBLEMS



Pre-formed for your needs

GB *PRE-FORMED* Silver Brazing Alloys are available in the size and shape your job requires. Pre-formed shapes, like those shown, are designed for the joint. They assure strong, safe connections with a measured, minimum amount of alloy to save you time and money.

Write today for facts about efficient, economical GB 88 Flux and GB Silver Brazing Alloys in random coils, strip, pre-formed rings or special shapes.

Dealer Distributor Inquiries Invited

Write for GB Data Book

GB Goldsmith Bros. DIVISION OF NATIONAL LEAD CO. Est. 1867

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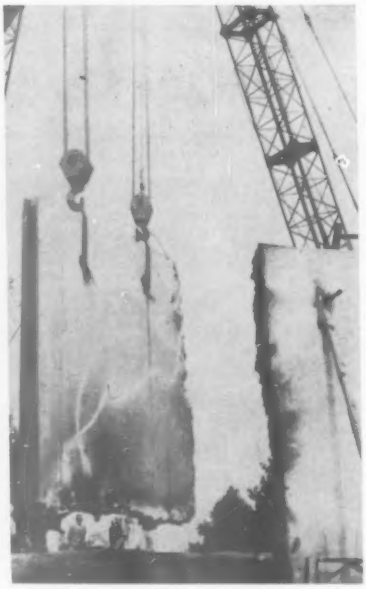
A Measured Amount of Silver Brazing Alloy Will Produce A Better Looking and More Cost Controlled Joint.



FINAL cut having been made, two 50-ton cranes easily lift a 22-ton section of the reinforced concrete wall up and away for disposal.

And the walls came tumbling down .....

Powder cutting torch tumbles the flood walls

CONCRETE, METAL or any other known hard material of any thickness bows to the piercing oxygen-powder mixture of a powder cutting torch.

Most recent evidence of this tool's capabilities: burning through two 18-in.-thick reinforced concrete flood walls as part of a demolition job for a flood control program in Endicott, N. Y.

Using Linde Co.'s newest powder lance, the job involved removal of two 17-ft-high flood walls.

Two vertical cuts were first made in each of the two sections to be removed. A hole was then pierced in each so that cables could be run through the concrete.

As each section was secured by the crane, a horizontal cut was made across the base of the secured section, making it possible for the crane to lift the cut section away.

Estimated cutting speed was approximately 2 to 3 lineal feet per hour. The powder lance also pierced the cable-hole through the 18-in. thick wall in 2 minutes, 30 seconds, or better than 7 ipm.

Lengths of standard black iron pipe are fitted into the front end of the powder lance, which is connected to an oxygen supply and a source of special metallic powder mixture.

The oxygen and powder are mixed in the pipe and carried to the material being pierced or cut by the consumable pipe. This mixture is then ignited at the end of the iron pipe, producing an extremely high-temperature reaction (estimated at approximately 8,000 F) that melts both ferrous and non-ferrous material.

On materials such as concrete, a recently introduced mixture of iron and aluminum powder is used. The aluminum powder added to the metallic powder further intensifies the cutting reaction, making it possible to slice easily through thick concrete.

Extensive field tests indicate there is no practical limit to the thickness of material that can be pierced or cut with this method. And the powder cutting torch is expected to find a widespread use in construction and steel industries.

HORIZONTAL cut across bottom of wall will free it for removal by the overhead cranes.

FOR ANY STAINLESS WELDING JOB

Drawalloy
CORPORATION

Stainless Steel Welding Wire

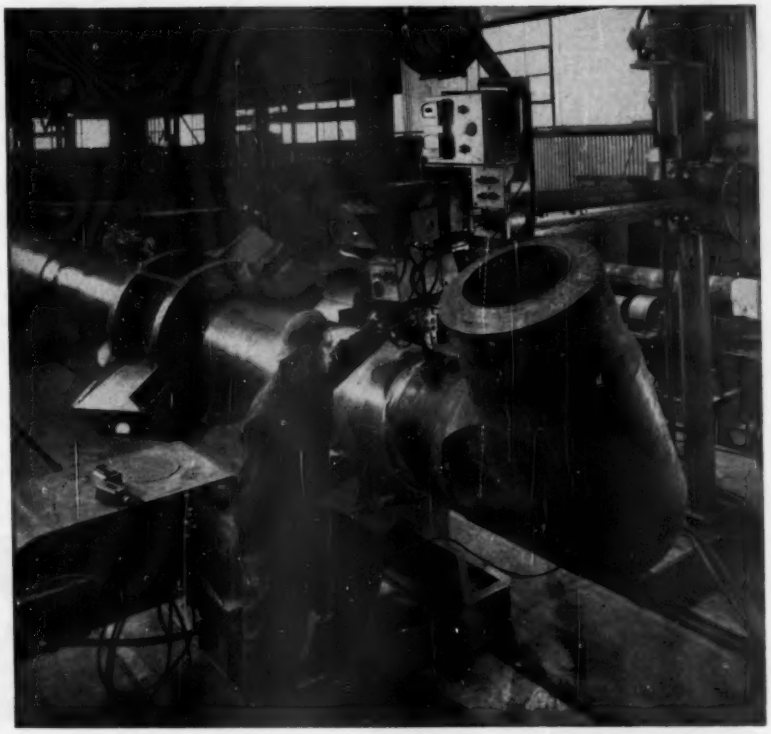


Photo courtesy of National Valve and Manufacturing Co., Pittsburgh, Pa.

Specify Drawalloy "quality controlled" stainless steel welding wire for *your* next "quality weldments." Your greatest advantage is experience . . . our experience in producing wires for welding exclusively. Because we are specialists, Drawalloy stainless steel welding wire is produced to strictly controlled specifications to provide the right chemistry, finish and temper for the finest quality weld metal and smoother operation in your automatic or semi-automatic equipment. Drawalloy stainless wires are available in all popular grades as well as 2¼ Cr, 1 Mo; 1¼ Cr, ½ Mo.

Why not discuss your stainless welding wire needs with your Drawalloy Distributor or Representative . . . a man with the products and knowledge to help you. Bulletin 355 DC provides complete information on every grade of Drawalloy wire. Write to: Drawalloy Corporation, Lincoln Highway West at Alloy Street, York 12, Penna.

DRAWALLOY
CORPORATION
STAINLESS STEEL & TOOL STEEL WELDING WIRE
THE WIRE MILL FOR THE WELDING INDUSTRY

ACRO
WELDER MFG. CO.
MILWAUKEE

WELDING
ENGINEERS

MACHINERY
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ESTABLISHED
1936

Soldering cuts production time, costs of plating racks

RACKS FOR JOB PLATING are now being fabricated with a high-strength, silver bearing stainless solder and non-acid flux at the North West Plating Co., Seattle, Wash.

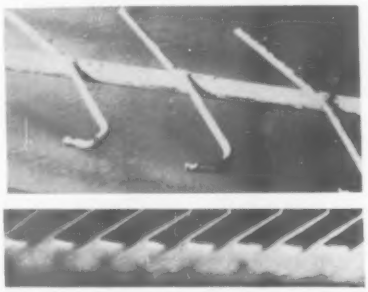
Previously, the firm bolted contact tips to the frame, but acid was able to seep into crevasses in the plastic coating causing electrolysis which weakened the racks.

At first, brazing was tried, but the heat annealed the copper contacts and they bent under load. Soldering was attempted next, but a conventional hard solder with minimum temperature requirement for application of 1,130 F was used. This heat also had an annealing effect.

Finally, a technical representative called in from Welders Supply Co., Seattle, established temperature limits. Solder was not to melt at 365 F, the heat at which the poly-vinyl chloride plastic coating is baked on, but heat must also be low enough to keep copper from annealing.

The silver-bearing stainless solder and non-acid flux selected has a working temperature of 430 F, and a tensile strength of 28,000 psi. Products of All-State Welding Alloys Co., White Plains, N. Y., are used.

The switch to soldering saved the firm $300 on the first 12 racks made. The new process eliminates hole drilling, and bolts, washers and nuts. And, fabrication time was slashed by 80% with product weight reduced while service life increased.



TOP, contact tips joined to plating rack frame. Bottom, section of rack after plastic coating has been baked on.

Riegel
. . . the preferred glove among skilled welders

TOPS IN DOLLAR VALUE

CHOSEN BY SKILLED WELDERS for extra heat protection, greater finger dexterity, and all-around comfort. Horsehide and "Flextan" leathers stay soft after dry-cleaning. Exposed seams completely welted. Seamless backs.

CHOSEN BY EXPERIENCED BUYERS for soft, sure comfort, longer wearability, excellent price, and quick acceptance in the plant...backed by Riegel's ready service and quick delivery.

COMPLETE LINE for any welding need. Let Riegel's specialists help match the right glove to the job. Ask for free catalog.

GENUINE HORSEHIDE PALM No. 956
Horsehide Palm, clute pattern cut extra long to prevent wrist chafing, and fourchetted for extra comfort and dexterity. Welted and wool-lined for complete protection.

HEAVY WELDER No. 997
Top quality green "Flextan", lined for heavy, hot jobs.

WELDERS MITTEN No. 967
Green "Flextan" leather, excellent protection, flexibility of finger movement.

SPOT WELDER No. 897
For lighter jobs, unlined green "Flextan" leather.

RIEGEL TEXTILE CORPORATION • Conover, N. C.

News shorts . . .

Handy & Harman has leased 36,000 sq ft in the office building to be erected by Uris Bros. at 850 Third Ave., New York . . . **Glenn Pacific Power Supply Corp.**, Oakland, is constructing a new building on property adjoining present plant and office facilities. Addition of new building will double present production area devoted to the manufacture of specialized power supplies for automatic and manual welding and for general industrial and laboratory use.

A new rolling mill to produce steel plates wider than any now available throughout the world will be built by **United States Steel Corp.** at its Gary Steel Works. Construction of the facility follows U. S. Steel's announcement last year that engineering planning had been instituted for a new wide plate mill in the Chicago area . . . **Lewis Welding & Engineering Corp.**, Cleveland, has formed a marine products division to handle the manufacture and sale of automatic hatch covers for sea-going cargo ships. Called "Auto-Hatch," the product consists of a set of articulated steel panel sections that are opened and closed by means of hydraulic power in a fully automatic operating cycle.

A new liquid hydrogen facility is now in operation at the Tonawanda, N. Y. laboratories of **Linde Co.** Capable of producing more than 25,000 liters per month of liquid hydrogen, the unit will service northeastern United States. At the same time, Linde's new oxygen producing plant (picture) at **Lukens Steel's** Coatesville, Pa. works is now on-stream. Most of the unit's 110 tons of oxygen per day will be used in open-hearth and electric furnace steelmaking; the remainder will be used for scarfing, scrap-cutting and general maintenance . . . Linde is also making available a new folding pocket card presenting in tabular form the physical property equivalents of some cryogenic fluids. The card lists boiling and melting points; critical temperatures and pressures; volume, mass, and thermal equivalents; and conversion factors. Write directly to the company.

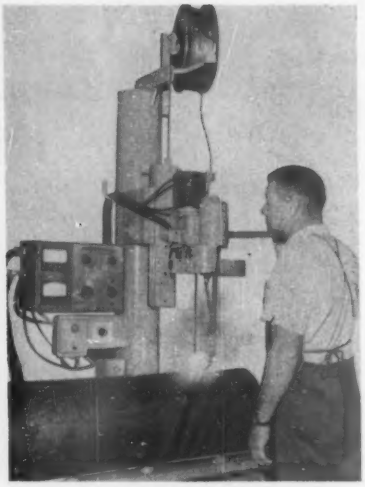
The **American Steel Warehouse Association**, Cleveland, voted to change its name recently to the **Steel Service Center Institute.** The organization is engaged in expediting the flow of steel to industrial plants and construction sites . . . **The Budd Co.** plans to install additional welding equipment as part of the general expansion program at its press, assembly, and shipping areas in Gary, Ind. The Gary plant is one of the newest of Budd's 12 manufacturing locations.

McKay Co., Pittsburgh, has developed a polyethylene covered fiber container used for packaging its hardfacing electrodes. Purpose of the package is to protect electrodes against moisture absorption and vibration . . . A giant wire fabric welder, designed to produce up to 60 tons of wire mesh in an eight hour shift, is taking shape at the **National Electric Welding Machines Co.** shops in Bay City, Mich. According to National engineers, a principal element of the unit's design is the saving of at least one-half the set-up time now taken by existing welders.

Air Reduction Sales Co. plans to construct a new air separation plant to supply oxygen by pipeline to the **Tennessee Coal & Iron Division of U. S. Steel Corp.** at Fairfield, Ala. In addition, ground has been broken for construction of another air separation plant at Baton Rouge to supply high purity liquefied industrial gases to the Gulf State area. This plant, which will cost over $2,000,000, will have a production capacity of 30 tons of liquid oxygen, nitrogen and argon per day. The installation will serve all the industries in the Gulf State area, particularly petroleum and petrochemical producers.

new products

. . . . . use card on page 81



Spud welder

New high speed spud welder welds blank or threaded spuds to water tank head, or tank sides, in roughly one-half the usual time. A complete circle weld can be accomplished on a ¾ in. spud in four seconds. Push button control activates fixture, which welds and stops automatically. Interchanging of spud locator adapters permits welding to standard size of spuds as small as ¼ in. diameter and as large as 4 in. diameter. Water cooled copper back up, inside tank, cools tank, speeds tank handling time and assures a smooth inside weld. *Leonard Precision Products Co.*

Circle No. 1

Plastic filler

The percentage of casting and assembly rejects is substantially reduced when BondZall plastic is used instead of cold solder or other standard fillers and sealers, says manufacturer. Miss runs, raised cores and sand cracks that occur in casting production; tears, cuts and dents of assembly line damage; ridges left on heavily burned plate by cutting torches, all can be filled and built up quickly with BondZall, says manufacturer. Repairs will not rust, disintegrate or corrode, and may be sawed, sanded, finished and painted. It is available in containers ranging from half pints to drums. *Schramm Fiberglass Products Inc.*

Circle No. 2

Temperature indicator

A precision temperature indicator designed to tell metallurgist, engineer and metalworker when a surface has reached a specific temperature, "Thermomelt" is available in stick, pellet and liquid form. Metal surfaces are marked with the stick or liquid or a pellet is placed on the surface. When the desired temperature is reached, the mark (or pellet) quickly liquifies. *The Markal Co.*

Circle No. 3

Toggle clamps

Two plunger-type toggle clamps lock in either an extended or retracted position. Designed for general-purpose use in light assembly work of the electronics, aircraft and allied industries, Model 601 and 601-0 have a rated holding pressure of 95 lb. *Detroit Stamping Co.*

Circle No. 4

Welding wire

D-27 welding wire, designed for the semi-automatic, continuous electrode Dynaweld process, received approval of the Canadian Welding Bureau and Lloyd's Register of Shipping. The wire has produced mechanical and usability results in flat and horizontal fillet positions equivalent to the requirements for electrode classification E6027 of AWS specification A 5.1-58 T, according to the CWB report. *Canadian Liquid Air Co., Ltd.*

Circle No. 5

Cover goggles

Two new coverglas goggles, for use by weldors and chippers, are said to fit 99% of prospective users. In addition to fitting over all types of prescription glasses, the goggles have standard 50mm round lenses, to effectively reduce stocking problems.

Chippers' model, No. 325, has perforated aluminum sideshields and is available with rigid bar bridge or adjustable rigid bridge. It is supplied with clear lenses. Weldors' Model, No. 329, is of identical construction except for indirectly ventilated side louvers. It is supplied with Filterweld No. 5 shade lenses. *American Optical Co.*

Circle No. 6

Portable welder

Portarc 180 is low-cost, 68-lb portable 180-amp welder with guaranteed high output. It is particularly useful for fast in-the-field farm welding, brazing, soldering and heating jobs, and on-the-move requirements of contractors. Low operating costs and versatility make it especially suitable for use in schools and small shops, says *Emerson Electric Mfg. Co.*

Circle No. 7

Steel electrodes

Stainless steel electrodes, for use with Model G Arc Spot Weld gun and Model 100 power supply, are now available for shipment, according to the manufacturer. *Bren Weld Corp.*

Circle No. 8

Automated welder

Manufacturers of automated strip welder claim it eliminates a major strip mill headache—joint separation. Made to join normal strip mill combinations of sheet width and thickness on an "as come" basis, the machine operates efficiently on both tin plate recoil and inspection lines and annealing and galvanizing lines. Welding speed is 30 fpm in a 30-second cycle, and a 150 kva welding transformer provides the necessary current. Featured are automatic system for welding roll dressing, automatic indexing of two independent power tools to correct depth of cut, and automatic adjustment of the lower roll to proper weld height. Adjustment for joining sheets of different widths is automatically accomplished by proximity switches which energize the welding rolls. *National Electric Welding Machines Co.*

Circle No. 9

Scale preventive

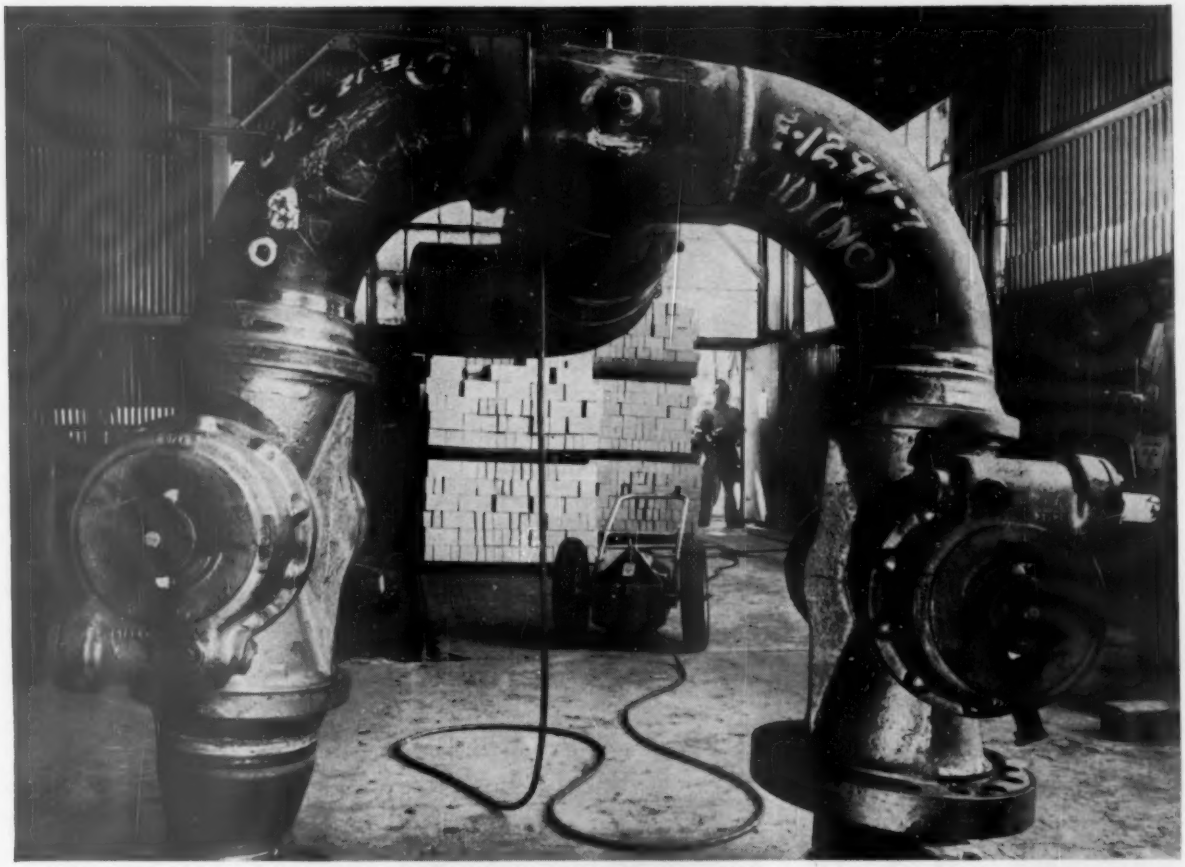
A new coating, Skalix, prevents scale formation on metal during heat treatment. Applications include stainless steel, nickel-chrome alloys, cobalt alloys, copper alloys, and the new exotic alloys. Applied by spraying or dipping, it adheres to the metal at furnace temperatures forming an oxygen-tight seal. As the metal cools, the coating pops off by itself. In many cases no further treatment is needed. To cut costs, no inert gas atmospheres in special furnaces are used. One gallon of Skalix covers 1,500 sq ft of metal. *Navan Products Inc.*

Circle No. 10

Tig automatic units

Two Tig automatic units, Models HMH-D and HMH-E, are specifically designed for long-run production welding on all ferrous and non-ferrous metals where good weld appearance is necessary. Model HMH-D is equipped with 3 in. and 12 in. offset bars to which the machine holder can be attached. The units operate at a maximum of 500 amp continuous duty cycle, d-c straight polarity using thoriated tungsten electrodes or 350 amp a-c. *Air Reduction Co., Inc.*

Circle No. 11



The entire circumference of the left hand weldment at the Tee fitting of this pipe assembly is being radiographed in a single exposure with a Model 50 Multitron. The unit can handle any isotope suitable for gamma radiography . . . and up to four separate sources can be contained in the same machine. A wide variety of exposures can be made—internal, panoramic and beam. Model 50 travels with ease anywhere in plant or field, requires no external power.

VERSATILE! Budd IRIDITRON and MULTITRON units for gamma radiography

- **Exclusive multiple-source heads**
- **Source strengths to 1000 curies**
- **For all exposures—beam, panoramic, internal**

Select the radiography equipment that meets your requirements from the 21 standard Iriditron and Multitron Models now available. One of these models will give you the method or methods of exposure, number of sources, source materials, source strengths, and type of mounting you need. Each model is distinguished by design features that assure you unsurpassed versatility, performance, and safety.

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Give spatter-free welds require little clean-up

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Everything your shop would need.

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NEW CATALOG

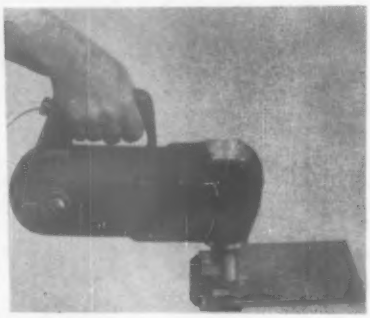
TFC

TENNESSEE FABRICATING CO.
1449 Grimes St. Memphis, Tenn.

Automatic positioning

New automatic piecepart positioning and clamping device is capable of decreasing welding set-up time 1400%, manufacturers report. Two parallel banks of segmented, flat, "hold-down" fingers are connected by a linkage system which automatically adjusts each finger simultaneously. Accurate piecepart edges may be aligned to within 0.001 in. *Airline Welding & Engineering Co.*

Circle No. 12



Nibbler

Heavy duty, portable nibbler Model EHN is said to be ideal for templet making. It cuts 1/4-in. steel plate and 5/16-in. aluminum where it is necessary to retain original contour. No rough edges are produced, eliminating need for grinding and buffing. Unit has anti-friction bearings on all rotating parts, a 2½ hp motor for a-c/d-c. Cutting radius is 8 in. *Fenway Machine Co.*

Circle No. 13

Bus duct

Flexible, centralized power system distribution is made possible by bus duct to distribute high-frequency power with minimum voltage drop and little change in phases relationship. Maximum voltage drop at 400 cycles per second is 1.28 volts per 100 ft. Nearly perfect phase relationship and wave form are maintained since individual conductors in the four-channel rigid aluminum housing are continually transposed and rotated while the housing grounds stray radio frequencies. *Westinghouse Electric Corp.*

Circle No. 14

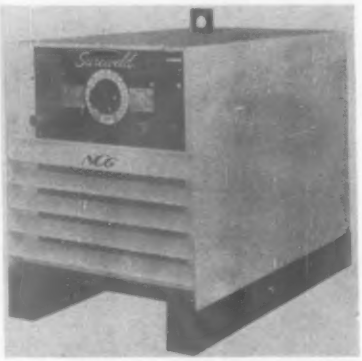
New flux dispenser

Manufacturer claims elimination of waste with improved automatic liquid flux dispenser. Flux forms a vapor which saturates the gas and goes on with the acetylene into the flame and out on the work. Two-unit design and chrome finish make the valve easier to disassemble, clean, and maintain. *All-State Welding Alloys Co., Inc.*

Circle No. 15

All-weather welders

New arc welder is completely weatherproofed against rain, cold, heat and salt spray, according to manufacturer's statement. Protection includes double-dipped



Class B insulation on transformers to provide maximum resistance to moisture and increased dielectric strength; fully sealed, semi-metallic rectifiers; non-corrosive on-off switches; and totally enclosed, lifetime-lubricated fan motors. *National Cylinder Gas Div., Chemetron Corp.*

Circle No. 16

Color gloves

New work glove in bright color provides spot identification for workers involved in hazardous applications or where signaling is necessary. Bright hues also tend to prevent loss of gloves. *Granet Corp.*

Circle No. 17

Grinding attachment

Available for both angle and straight wheel type portable grinders, new belt grinding attachment is useful for grinding all contours, and particularly handy where a straight-line finish is desired. Attachment supplied with three 2 x 20 in. abrasive belts built of strong alloys for heavy-duty use. *The Nedco Co.*

Circle No. 18

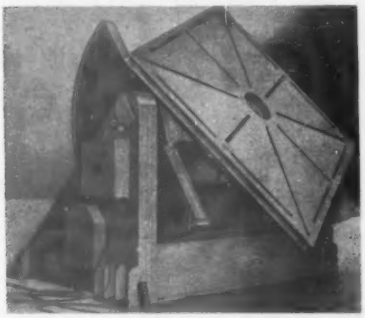
Die repair welder

A new method of repairing die scratches, cavities and undercuts that occur in die casting is called Dot Welding. It is a fusion of metal pellets by a gun type welding device. The die need not be removed from the machine to make the repair, with fusion produced by a short pulse of high density electrical current in the welder. Because the electrical impulse is so short, the die need not be pre-heated. This current raises the pellet temperature to point of fusion and allows it to flow into cavity or scratch. *Mid-States Welding Mfg. Co.*

Circle No. 19

Welding positioner

Rated at 350,000 lb capacity at 12 in. center of gravity location, the Model G3500 positioner features 4 selective variable speed ranges from .08 rpm to .40 rpm. The "Excalibur" has found application in the fab-



rication of nuclear reactor vessel components, the maintenance of bells and hoppers for blast furnaces and for welding huge transformer casings. Company claims the highest load capacity ever manufactured. *Aronson Machine Co.*

Circle No. 20

Sanding drum

New inflated sanding drum allows abrasive to follow contours and present more abrasive to the work. No part of the core or side plates extends above the abrasive, providing an unrestricted working area across the entire surface. Drum is leakproof and requires no adhesive or sealant to fasten to core. All parts replaceable, including contact drum. Standard bore size is 1¼ in., with larger sizes available. *Nu-Matic Grinders, Inc.*

Circle No. 21

Do YOUR welding helmets help produce more and better welding?

YES!...they do if they're Fibre-Metal's

FIBERGLAS* WELDING HELMETS

Undeniable comfort, clearest wide vision and assured safety are basic quality features of these Fiberglas welding helmets. FIBRE-METAL compression-molded, Fiberglas-reinforced polyester resin shells offer the very finest in durable face protection. Proper glass fiber distribution and a "beaded edge for strength" insure long-lasting, trouble-free helmet life. Shells are self-extinguishing, are unaffected by heat and moisture, will not warp or lose shape, may be easily and quickly cleaned and sterilized. *Welders TELL US these helmets help produce more and better welding!*

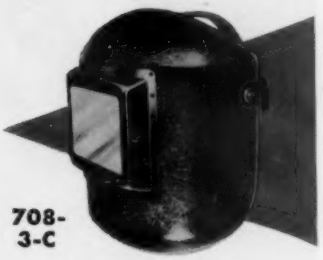
All helmets have Ratchet Adjustment "free floating" Headgear, impact resistant adjustable friction joints and adjustable chin rest. Glassholders are available in plastic, steel or Dowmetal, in either fixed or lift-front styles. All types of helmets are described in Catalog No. 26.

Ask your Welding & Safety Distributor!

*OWENS-CORNING TRADE MARK

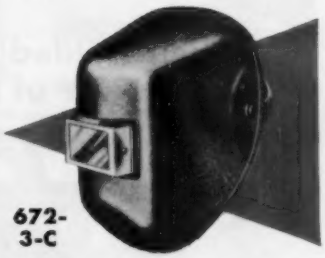
702-3-C

This is a popular standard-size Helmet that offers excellent fume and light seal with extra ventilation. Has all the famous Fibre-Metal comfort features. Offers variety of fixed and lift-front glassholders.



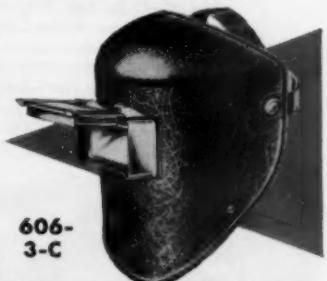
708-3-C

Over 120% increased vision with its 4½" x 5¼" lens...more vision both vertically and horizontally. Reduces eyestrain and fatigue. Excellent for welders who must wear bifocals, or trifocals, while welding.



672-3-C

The popular narrow-front shell for compact, lightweight protection. Best for welding in tight spots...eliminates flat, spatter-collecting surfaces. Less pitting, lasts longer. 674-3-C has lift-front glassholder.

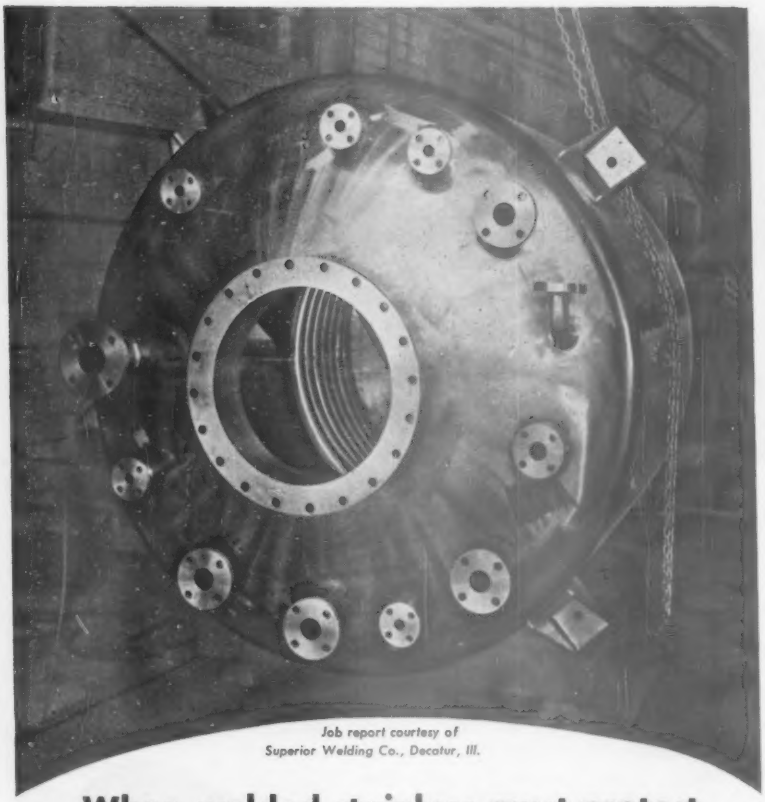


606-3-C

Features extended neck and chest protection with greater ventilation. Standard-size shell. Also available with an Inner Bib *(See our Catalog No. 26)* for extra fume and light seal.

The FIBRE-METAL Products Company | CHESTER PENNA

In CANADA: Fibre-Metal (Canada) Limited, Toronto



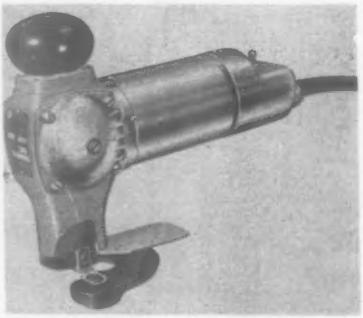
Job report courtesy of
Superior Welding Co., Decatur, Ill.

When welded stainless must protect the PURITY of the products handled

WELD WITH ARCOS

STAINLESS ELECTRODES

This highly polished kettle is fabricated from type 304 ELC stainless steel. In use, it must process chemicals without a trace of contamination. Arcos CHROMEND 19-9 Cb Electrodes were selected by the fabricator to assure a weld metal of high uniformity . . . one whose chemical composition would not break down under corrosive attack and contaminate the product. Welding was done by manual arc. When you, too, must safeguard product quality, specify Arcos Electrodes for the job. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.



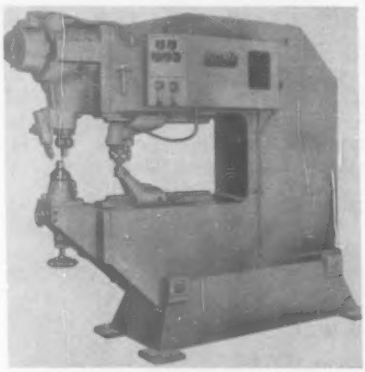
Electric shear

Hand-held electric shear weighing only 6½ lb will slice through 30 ft per minute of No. 18 gage cold-rolled steel, says manufacturer. Designed to deliver 2,500 cutting strokes per minute under full load, the shear will handle monel metal or stainless steel in thicknesses up to 20 gauge. *Black & Decker Mfg. Co.*

Circle No. 22

Shearing machines

Used for straight, circle and irregular shearing, louver, inside square and slot cutting, the Pullmax U-10 features pneumatic remote controls to raise and lower



the cutting head. Cutting capacity is ⅜ in. in mild steel. Also employed in beading, dishing, edge bending and joggling. *American Pullmax Co.*

Circle No. 23

Ultrasonic cleaner

Incorporating a 2-gallon stainless steel tank, this ultrasonic cleaner is said to increase cleaning coverage. Model 220 is 9 in. long, 6 in. wide, 10 in. deep. A 115 volt single-phase 60 cycle generator is designed for continuous operation. Driving elements constitute 44½% of the bottom of the tank. *National Ultrasonic Corp.*

Circle No. 24

High capacity chargers

Three single-circuit battery chargers are designed to charge lead-acid or nickel-iron-alkaline industrial truck batteries. Rated 7½, 10 and 15 kilowatts, each one is 100% automatic in operation. Charge controls include automatic cut-off device, magnetic, across-the-line motor starter providing thermal over-load, undervoltage, and phase-failure protection to the motor. *Motor Generator Corp.*

Circle No. 25

Dust mask

Lightweight polyethylene nusiance dust mask is used for protection in intermittent, non-toxic paint spraying operations as well as against dust. Entire unit of outer frame, filter, inner frame and headbands weigh less than an ounce. Polymer filter can be washed, dry cleaned and re-used; is not affected chemically by water, soap, oils, detergents or perspiration. *Welsh Manufacturing Co.*

Circle No. 26

Photo-inspection

New method of inspecting brazed metal honeycomb sections for structural integrity cuts down on expense and time, say manufacturers. Equipment adjustments for various thicknesses are set in about five minutes. X-ray head and detector move across the structure being inspected, exposing 16 in. by 16 in. sections when used on ¾ in.-thick panels. Each projection on a fluoroscopic screen is automatically recorded by the camera and the film is ready for inspection within minutes. *Picker X-Ray Corp.*

Circle No. 27

Abrasive disc life

Improved manufacturing processes have resulted in substantially longer working cycles of the manufacturer's complete line of abrasive discs, according to their statement. Greater ability to withstand pressures reduces grain loss to a minimum. "Improved process" discs range from 5 to 9⅛ in. in diameter with ½ and ⅞ in. center holes. *Michigan Abrasive Co.*

Circle No. 28

Counter display

Four fast-moving items of special interest to weldors have been made available in self-service counter display packages. The units are designed for use in job shops, plumbing, refrigeration and air conditioning as well as other service industries. The silver alloys are supplied in attractive display boxes containing 24 shatter-proof, transparent plastic tubes (for rods) and 12 tube kits (for solder and flux).

Displays come four boxes to a standard carton. They tie in with today's trend toward self-service, pre-packaged selling, according to *All-State Welding Alloys Co., Inc.*

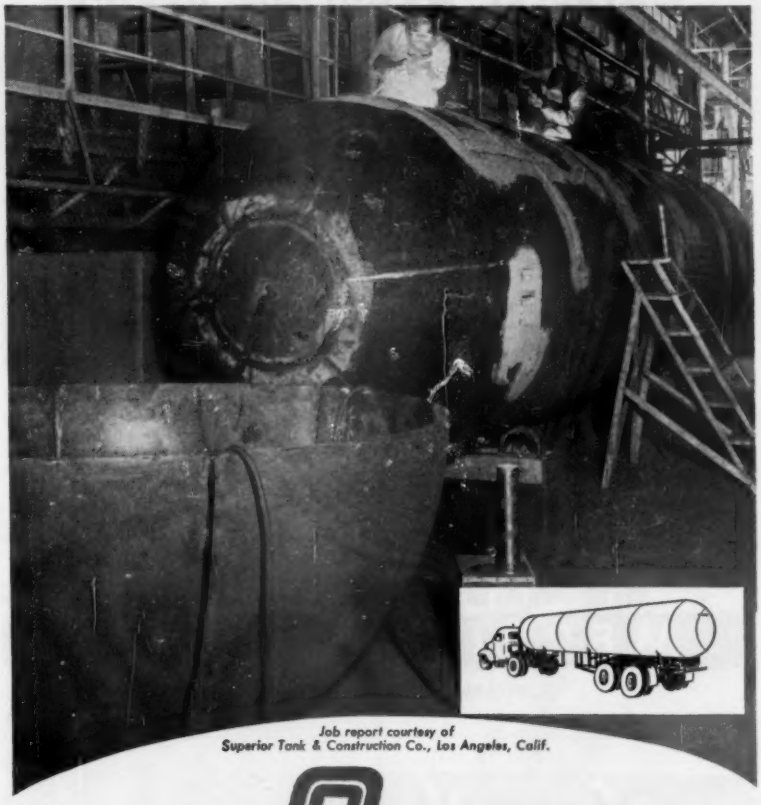
Circle No. 29

Voltage regulator

A new static voltage regulator, Sta-Vo-Trol, uses rate feedback and industry proven zener diode sensing. Static components eliminate tubes, brushes and other moving parts. Rated 1 kva, single phase, 0 to 8.5 amp, 120 volts, the regulator maintains ±.25% bandwidth accuracy for a constant power factor load. *General Electric Co.*

Circle No. 30

How X-Ray Quality Welds Make Low Alloy Steels Pay Off



Job report courtesy of
Superior Tank & Construction Co., Los Angeles, Calif.

WELD WITH ARCOS

LOW HYDROGEN ELECTRODES

The vessel being welded is part of an L.P.G. tank truck. For high strength with low weight—USS "T-1" steel is used and welded with Arcos Ductilend 110 Electrodes. These tanks meet or exceed ASME code requirements . . . and all Ductilend 110 welds qualify with X-ray soundness. Ductilend 110 is an Arcos Low Hydrogen Electrode especially developed for welding high strength notch tough steels of the 110,000 psi tensile strength range. Data sheet on request. ARCOS CORPORATION • 1500 South 50th Street, Philadelphia 43, Pa.

MERRILL MB BROTHERS

MATERIAL HANDLING DEVICES

- Safety Factor—5 to 1
- Factory tested at triple rated capacity.
- Will lift from horizontal or vertical position.
- Cam and Pads of case hardened tool steel.
- All operating parts replaceable when worn.
- Swinging or jerking loads will not affect grip.
- Useful for positioning in welding operations.

The HEAVIER the LOAD . . . . . the TIGHTER the GRIP! 3-T-17

MERRILL BROTHERS

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DOC TUFFY TO THE RESCUE

REJECTS LIKE CRAZY, JOE! YOU GOTTA DO SUMTHIN'!
THEM REJECTS ARE CAUSIN' ME TH' TORTURES O' HADES, DOC! I'M GOIN' BATS!
SUREST CURE FOR REJECTIVITIS, SIR, IS TUFFALOY COLD-FORMED TIPS. ASK YOUR P.A. TO GET 'EM!

Old-fashioned cast tips laying profits low? Switch to TUFFALOY COLD-FORMED TIPS. You'll get better conductivity, longer life . . . better fusion, fewer rejects.

Get Tuffaloy Catalog and Price List. Write or call your nearest Airco or Tuffaloy office.

TUFFALOY.

AIRCO

AIR REDUCTION SALES COMPANY

A division of Air Reduction Company, Incorporated

150 East 42nd Street, New York 17, N. Y.

Air Reduction Pacific Company • Air Reduction Canada Limited

Leak detector

Series 800 line of high production leak detection systems are designed specifically for in-line operation and high production rates. Results are quantitative so that changes in quality may be detected, recorded, and action taken prior to rejection. Fully and semiautomatic systems are suited for production testing of all types of vacuum, pressurized and hermetically sealed products. Series 800 incorporate a standard mass spectrometer type leak detector sensitive to helium gas which can also probe rejected items to determine the exact location of the leak. *General Vacuum Corp.*

Circle No. 31

Solenoid valves

New 3-way "Quick exhaust" solenoid valves have oversized ¼ in. diameter exhaust orifice, eliminating the need for connecting a separate quick bleed valve in the circuit to speed up the exhaust cycle. Completely packless in design: no stuffing boxes, sliding glands, etc. Only two moving parts are utilized. Can be provided in any voltages up to 550 volts, 60 cycles. *Automatic Switch Co.*

Circle No. 32

Weld kit

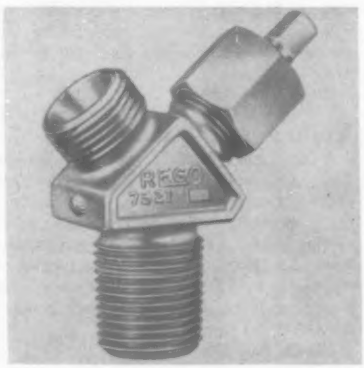
Weld help kit is a sampling package of products designed to facilitate difficult welding work. Kit contains eight diameters of carbon rods, three thicknesses of carbon plate, a can of carbon paste, a can of surface-protection compound, and a well-illustrated manual showing some of the numerous applications for these materials. *Arcair Co.*

Circle No. 33

Cylinder valve

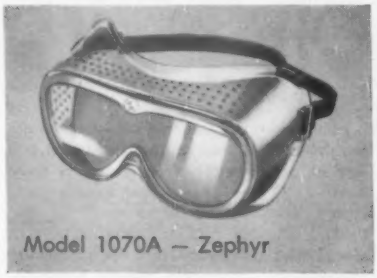
Valve for use on acetylene cylinders containing 10 cu ft of gas or less features case hardened stem which reduces maintenance by resisting deformation caused by use of pliers to operate valve. Each valve is stamped to facilitate planned maintenance. Model 7321 valve has a rugged forged brass body with a ⅜ in. NGT inlet and CGA 201 outlet connections. *Bastian-Blessing Co.*

Circle No. 34



THE *NEW* VIEW FOR WELDERS!

WELSH sets the pace in creative design . . . new modern materials and techniques for your more effective eye protection.



Model 1070A — Zephyr

WELSH ZEPHYR — New, increased working visibility . . . greater top ventilation! The first major improvement since the origin of the soft-side. Choice of five ventilation styles.

Model 5070 — Cyclops

WELSH CYCLOPS — A one piece aperture welding goggle . . . soft side frame provides the ultimate in comfort, fit and visibility. Simplified lens holder permits easier changing of filter and cover plates.

Model 5050 — Soft-I

WELSH SOFT-I — Cushion-fit eye protection featuring unique, soft, pliable frame cover goggles. Deep cuts fit easily over largest prescription goggles.

WELSH — *Willingly Worn*

by Workers Everywhere

WELSH

MANUFACTURING COMPANY

9 MAGNOLIA STREET, PROVIDENCE, R. I.

Welding positioners

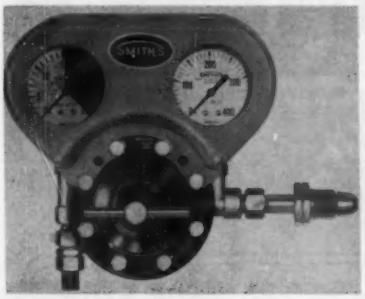
Formerly available only by special order, a hole through the table and table spindle is now standard on all welding positioners of from 500 to 10,000 capacities, according

to the manufacturer. The hole facilitates use of gas lines for back up and preheating, and air lines for pneumatic clamping. *The Harnischfeger Co.*

Circle No. 35

Safety regulator

A "hard hat" covers ordinarily exposed gages of regulator, protecting them from exterior abuse. A safety inlet connector fits the inlet connection to the regulator, pro-



viding quick repair of damaged connections without special tools. Available for use with oxygen, acetylene, and LP gases. *Smith Welding Corp.*

Circle No. 36

Silicon rectifier

Style 33 silicon rectifier is rated at 37.5 amp average at 25 C ambient on a 5 x 5 x 1/16 in. copper heat sink. Peak inverse voltages range from 50 to 400 volts, in 50 volt steps. Temperature range is from minus 75 to plus 175 C. *Syntron Co.*

Circle No. 37

Epoxy adhesive

New 100% solids, unfilled, modified epoxy adhesive is applicable for metal-to-metal and metal-to-plastics bonding. Intermediate strength and clear pale amber, the adhesive's mixed weight, with hardener, is approximately 9.6 lb per gal. At room temperature, the bonded assembly can be handled in 6-8 hours and develops 85% of maximum strength in 14-24 hours. *Rubber & Asbestos Corp.*

Circle No. 38

Tempilstik°

*temperature indicating crayons**

**Also Tempil° Pellets and Tempilaq° (liquid form)*

***Tempilstik*°—a simple and accurate means of determining preheating and stress relieving temperatures in welding operations. Widely used in all heat treating—as well as in hundreds of other heat-dependent processes in industry. Available in 80 different temperature ratings from 113°F to 2500°F . . . $2.00 each.**

Send for *free* sample Tempil° Pellets. State temperature desired . . . Sorry, no sample Tempilstiks°

Most industrial and welding supply houses carry Tempilstiks° . . . if yours does not, write for information to:

WELDING SALES DIVISION

Tempil° CORPORATION

132 West 22nd St., New York 11, N. Y.

THERMO is FIRST Again with a Revolutionary Sta-Kleer All-Plastic Cover Lens

Never Before Available for Use in Welder's Helmets

40% MORE LIFE

LABORATORY TESTS PROVE WHY . . . .

✓ TWICE as Scratch Resistant as any other All-Plastic Lens on the market.

✓ 40% MORE Resistance to Molten Slag

Make your own test and PROVE to yourself that THERMO Sta-Kleer All-Plastic are the cheapest and safest Cover Lens you can wear.

See Your Welding Supply Dealer or write for a FREE Sample TODAY

THERMACOTE Company
108 S. DeLacey Ave., Pasadena, Calif.

save

. . . with WELD-REEL and REEL-KING automatic hose and cable reels

. . . **SAVE TIME** — time that's lost uncoiling or untangling hose and cable.

. . . **SAVE WEAR AND DAMAGE** — hose and cable not in use is protected from wear, falling objects etc. Minimum surface exposed at any time.

. . . **SAVE ACCIDENTS** — keeping hose and cable off the floor practically eliminates tripping accidents.

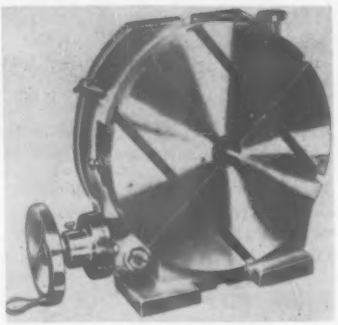
Available in sizes and capacities to meet a wide range of industrial requirements.

WELD REEL REEL KING

UNITED SPECIALTIES, INC.
BOX 698 - EL DORADO, ARKANSAS
Distributed in Canada by CANADIAN LIQUID AIR CO., LTD., Montreal

UNITED SPECIALTIES, INC.
Please send catalog application brochure
NAME _____
COMPANY _____
STREET _____
CITY _____ STATE _____

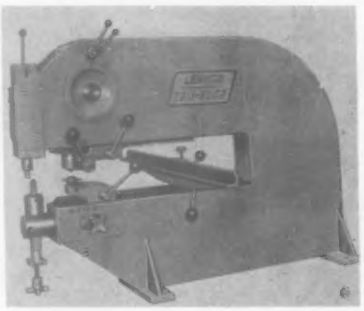
Write for brochure



Rotary tables

Four additional models of rotary tables are designed for use in both horizontal and vertical positions. They are made in three sizes—9, 12 and 15 in.—and have a guaranteed accuracy of 60 seconds or less through 360-deg rotation. Dividing attachments, with easy-to-follow index plates, are available for all models. *Troyke Mfg. Co.*

Circle No. 39



Forming machine

With only five moving parts, the Model TE-100 is claimed to have an edge-cutting capacity up to 12 gage in mild steel plate and 16 gage in stainless steel. Strokes per minute, cutting from 1750 up through 3500, are automatically regulated according to material's thickness. The TE-100 is portable and operates on 110 volt, 60 cycle AC current. *Lennox Tool and Machine Builders.*

Circle No. 40

Safety products

Firm's line of safety products has been enlarged with introduction of new coverall goggles and new plate holder for chippers and weldors.

The goggle, made of soft vinyl, will fit easily over prescription glasses. Louver style for weldors is available in Arc-Ban welding glass, shades from No. 3 through No. 6, and CR-39 plastic cover lenses are used for lens protection. Chippers model, with mesh screening, can be assembled with flat or 6.00D clear lens and in Ray-Ban Nos. 1, 2 and 3 shades.

Flexible plate holder has been especially designed to offer a wide range of vision, and a secure but comfortable fit. *Safety Products Dept., Bausch & Lomb Optical Co.*

Circle No. 41

About people . . .

Cobb

O'Connell

F. Howard Cobb, formerly the Cincinnati resident salesman for Page Steel & Wire Division, American Chain & Cable Co., Inc., Monessen, Pa., has been appointed district sales manager at Houston.

T. F. O'Connell has been appointed general sales manager, distributor products department of Linde Co. He will have full responsibility for execution of the sales program of Linde's distributor products department.

KSM Products, Inc., Merchantville, N. J., has appointed *John T. Rayner* regional manager for the San Francisco area and *William Kirksey* to the Portland and Seattle area. Also, *Claude A. Batuk* was named manager of the Chicago region, and *Walter Kiel* was appointed to head the New York state operations. In the south, *James A. Leach* was appointed to manage the Atlanta area.

William J. Dobranski has joined Dynamic Research, Inc., a subsidiary of Air Products, Inc., representing K-G equipment in southern California.

James A. Hudson, formerly Midwestern manager of gas products sales, has been appointed western sales manager of bulk gas sales by Linde Co. He will be engaged in the sales and promotion of on-site tonnage oxygen plants to the steel, chemical, and petroleum industries.

Leslie B. Worthington was elected president and chief administrative officer of United States Steel Corp., succeeding the late *Walter F. Munford*. Worthington was also elected a director and chairman of the executive committee. He was formerly president of the Columbia-Geneva Steel Division of U. S. Steel.

LOOKING FOR THE BEST? Buy
INDEPENDENT
Acetylene Cylinders
Unconditional Guarantee
Proven Filler - No "Spitting"
No voids - No soft Spots
Seamless Cylinders for Durability
Alloy steels for Lighter Weight
Cylinder Shells - Meet all ICC Requirements
All Cylinders "WHEELABRATOR" cleaned
Standard Sizes in Stock - Special Sizes on Request
Independent also manufactures Low Pressure Acetylene Generating Plant Equipment.
SEND YOUR INQUIRIES TODAY TO
INDEPENDENT ENGINEERING COMPANY, Inc.
Manufacturers of
CONSULTING IECO DESIGNING
RESEARCH
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE - OXYGEN - NITROGEN - ARGON
O'FALLON 5, ILLINOIS

All-State's JET FLUX® and JET FLUX DISPENSER® on production line at Griggs Manufacturing Co. Acetylene and Jet Flux mixed and fed automatically from Dispenser.

to get the best joint, use the right

FLUX

you name it—ALL-STATE has it

ALL-STATE makes quality fluxes for torch and soldering iron applications on all commercial metals . . . in the form you prefer: liquid, paste, powder, flux cored solders, flux coated rods. Working temperatures range from 300F to 2200F. Designed for maximum wetting action, minimum fuming. For instance:

DUZALL . . . a new liquid flux for all soft solders, all metals (except light metals). DUZALL eliminates pre-cleaning, increases capillary action, leaves minimum deposit. Comes in handy 4 oz. refillable dispenser-type plastic containers, and in larger units.

#11 BRAZALOY® . . . a paste or powder flux for use on 14 ferrous and bronze alloys. Wide temperature range: 1200F to 2200F. Non-corrosive, non-fuming. Also available extruded on Nickel Silver welding rods.

#31 BRAZALOY® . . . a highly active aluminum brazing flux that gives maximum wetting action, excellent capillary flow. Protects surfaces from discoloration, requires less after-cleaning. An outstanding temperature indicator.

S200 SILVER BRAZING FLUX . . . melts at 600F, becomes transparent at 1100F, protects heated base metal to 1800F. Induces excellent capillary action and flow of silver alloys.

Send for free copy of 54-page Instruction Manual and for information on custom coating your welding rods.

Distributor-Stocked, convenient to buy. Economical to use.

ALL-STATE WELDING ALLOYS CO., INC., White Plains, N. Y.

Call WHite Plains 8-4646 or write for nearest distributor

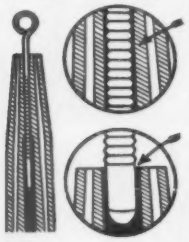
World's Finest CUTTING and WELDING TIP CLEANERS

WYPO WIPES AND POLISHES

YOU GET SO MUCH MORE IN WYPO Made of Stainless Steel

DOUBLES THE LIFE OF YOUR WELDING AND CUTTING TIPS

The exclusive circle design found only in Wypo Cutting and Welding Tip Cleaners provides as many as 60 more cleaning edges per inch of cleaner.



These rounded outer edges of cleaning ridges clean and polish tip orifice without scratching or cutting.

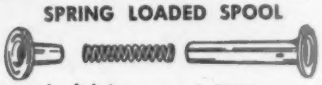
This smooth pilot guides WYPO Tip Cleaner into tip Will not enlarge or damage tip port.

This cross section view of WYPO Cleaning Surfaces shows these exclusive features:

Rounded cleaning surfaces that won't jam or cut.

Straight sided valleys insure thoro cleaning by removing all waste.

SPRING LOADED SPOOL



Spring loaded brass spool. Will not rust. Holds cleaners securely in case.

DOUBLE WOUND EYES

Insures longer life for small sizes of WYPO Tip Cleaners. Will not pull out of case.

NOW AVAILABLE IN 3 CONVENIENT SETS

WYPO TIP CLEANERS

STANDARD SET

CLEANER NO.	FOR DRILL
7	75-74
8	73-71-71
10	70-69-68
12	67-66-65
14	64-63-62
15	61-60
16	59-58
17	57
18	56
22	55-54
24	53-52
26	51-50-49
28	48-47
30	46-45
31	44-43
34	42-41
37	40-39-38
39	37-36
42	35-34-33
44	32-31
48	30

MADE IN U.S.A. PAT. NOS. 2429581, 2473759 IN CANADA 1940

STANDARD SET OF (12) Cleans (27) Drill Sizes Nos. 75 to 49 Incl.

WYPO TIP CLEANERS

JUMBO SET

CLEANER NO.	FOR DRILL
50	48-47
45	46-45
33	44-43
36	42-41
37	40-39-38
39	37-36
42	35-34-33
44	32-31
48	30

MADE IN U.S.A. PAT. NOS. 2429581, 2473759 IN CANADA 1940

JUMBO SET OF (9) Cleans (19) Drill Sizes Nos. 48 to 30 Incl.

MASTER SET

CLEANER NO.	FOR DRILL
7	75-74
8	73-72-71
10	70-69-68
12	67-66-65
14	64-63-62
15	61-60
16	59-58
17	57
18	56
22	55-54
24	53-52
26	51-50-49
28	48-47
30	46-45
31	44-43
34	42-41
37	40-39-38
39	37-36
42	35-34-33
44	32-31
48	30

WYPO TIP CLEANERS PAT. NOS. 2429581, 2473759 IN CANADA 1940

MADE IN U.S.A.

MASTER SET OF (21) Cleans (46) Drill Sizes Nos. 75 to 30 Incl.

Replacement cleaners available. Cleaning Range —Cleaner No. & Drill Nos. stamped on back of each case. WYPO GIVES YOU MORE!

SOLD BY LEADING WELDING SUPPLY DEALERS

MAITLEN AND BENSON, INC.
1395 Obispo St., Long Beach 4, Calif.

Iapalucci

Gibbons

Francis P. Iapalucci has been named plant manager of the Lake Erie Machinery Corp., Buffalo. He was formerly with Baldwin-Lima-Hamilton Corp., Eddystone, Pa.

United Specialties Inc., El Dorado, Ark., has announced the appointment of *James A. Gibbons* as regional sales manager for the territory from Chicago south to the Indiana and Ohio state lines and east to the New England and Atlantic states.

For many years an official of the Lindberg Engineering Co., and the Lindberg Steel Treating Co., Chicago, *Henry G. Magnussen* has been named adviser to the director, Metalworking Equipment Division, Business and Defense Services Administration, of the U.S. Department of Commerce.

Lincoln Electric Co., Cleveland, has appointed *Jean J. Revelt* as public relations assistant.

Minnesota Mining & Mfg. Co., St. Paul, has named *F. M. Metcalfe* as sales manager of the coated abrasives and related products division. In addition, *C. L. Murphy* was named marketing manager and *W. E. Marsden* was named Eastern region sales manager.

S. C. Trager has been appointed manager of the Pure Carbonic Co.'s distribution department.

Aluminum Co. of America has appointed *John R. Long* to replace *Russell G. Anderson*, who retired as chief test engineer of the company's Cleveland development division. Long has been with Alcoa since 1941.

Norman A. Witzleben has been elected secretary-treasurer and a director of National Electric Welding Machines Co., Bay City, Mich.

You pay for the best– BE SURE YOU GET IT!!

Thousands of welders have been sure of the best by switching to

HI-AMP® ELECTRODE HOLDERS

30% More Heat Resistant than any other make.
Brilliant Red and Yellow Glass Fibre Colors insures identification of Holder anywhere in plant—Valuable Safety Feature.
Low initial cost, easy and economical to maintain.

LENCO, Inc. JACKSON, MO. Weld with HI-AMP

NEW PORTABLE SINGER SCREEN

PROTECTION ON ALL 4 SIDES

NOW — a lightweight portable screen designed for complete enclosure. Easy, fast slip-joint assembly (no threads). Rust-proof finish. In 3 curtain materials:

JOHNS-MANVILLE ALUMINIZED ASBESTOS cloth — the last word in protection . . . neoprene-coated FIBER GLASS . . . 12 oz. fire-resistant DUCK. All sizes. Also available in single and three-sided models. Ask your dealer or write us.

16 PAGE CATALOG

Complete line of work gloves, welding gloves and safety clothing.

Special Products Division

SINGER GLOVE MFG. CO.

860 W. Weed St., CHICAGO 22, ILL.

SEE OUR AD IN WELDING DATA BOOK

William Arter has joined the Los Angeles sales staff of the Welding Products Division, A. O. Smith Corp., Milwaukee. A graduate welding engineer, Arter will service the southern West Coast area.

Harry L. Stanyon has been named to the sales staff of Fibre-Metal Midwest, Inc., Chicago. He will cover the Michigan, Wisconsin and Illinois area, calling on welding and safety supply distributors only.

Niels C. Miller, president and founder of Miller Electric Mfg. Co., Appleton, Wis., was recently elected to the board of governors of the National Electrical Manufacturers Association. Miller will represent the arc welding section on the board for a three-year period.

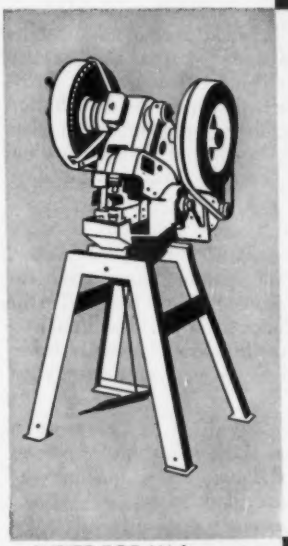
Purcell

Bernard (Bud) Purcell has been named assistant vice president in charge of operations and general manufacturing manager of Emerson Electric Mfg. Co., St. Louis. Other appointments were: *Don Norton*, assistant manufacturing manager and manufacturing engineer in charge of the new Manufacturing Engineering Division; *William E. Roof* and *Burt Lasko*, assistant manufacturing engineers; and *Edward Johnson*, production superintendent.

James E. Brown has been named manager of operations for the Chicago territory of U. S. Steel's American Steel and Wire Division. He succeeds *Nelson W. Dempsey*, who retires after 42 years of service.

New sales director for South American countries, All-State Welding Alloys Co., Inc., White Plains, N. Y. is *Jack Muller*. Muller will appoint and train new distributors, service and expand the sales of existing distributors, and sell to large manufacturing accounts and government agencies.

BATEMAN
BANTAM
IRON WORKER



THE ONLY IRON WORKER OF ITS KIND ON THE MARKET TODAY

No Grinding Necessary After Cut. One Stroke Cycle Clutch Operater by Hand or Foot

The Bateman "Bantam" cuts 2" x 2" x ¼" angles and ¼" x 4" flats. Standard punches will fit this machine. The Coper will cope 1¼" through ⅛" material. It will punch ½" hole through ¼" material. With the clutch open, the Bantam will make 44 strokes per minute. It is made of high-grade cast iron, with the clutch, pin and dog made of hardened steel. The blades are made with tool steel. It is powered with a fly wheel and gear drive, and uses a small ¾ hp motor, 1750 rpm.

Bateman Bantam with punch....$575.00
Shear only $495.00
Shipping wt. 750 lbs.

WRITE TODAY for complete information and name of nearest distributor

BATEMAN FOUNDRY & MACHINE
MINERAL WELLS, TEXAS

NATIONAL CARBIDE
IN THE RED DRUM

HIGHEST QUALITY

DUST FREE

DEPENDABLE SUPPLY

Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

National Carbide Company
A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED
GENERAL OFFICES: 150 EAST 42ND STREET, NEW YORK 17, N. Y.
AT THE FRONTIERS OF PROGRESS YOU'LL FIND AN AIR REDUCTION PRODUCT

COMMANDO

ROD

No Flux Required

Ideal for Brazing Aluminum and Welding Zinc Base Diecastings. COMMANDO ROD is easy to use with all types of welding equipment. May be applied with regular torch; acetylene and air torches; hydrogen, natural gas or bottled petroleum gases. Flows freely at 715°.

Other Commando Products

- ★ Tip Cleaning Drills
- ★ Lighters and flints
- ★ Goggles head bands
- ★ Ferrule crimper
- ★ Soapstone holders

J. M. EAGLE INDUSTRIES

2715 Oak Street Kansas City 8, Mo.

QUIK HEAT

up to 2200° F.

CLEMENTS

Cadillac

SEE US AT BOOTH 1347 Plant Maintenance and Engineering Show

MODEL K

BLOWTORCH

Here's a big, efficient blowtorch for all kinds of heat treating and production processes—yet it is completely and easily portable. Operates economically on either natural or manufactured gas. Produces heat up to 2200° F. in seconds! 1/3 h. p., Universal Motor. Sealed, precision ball bearings require no oiling. Equipped with metal stand, 10 ft. of gas hose and 20 ft. of reinforced rubber covered Underwriters' Approved cord with plug.

ask for **BULLETIN**

CLEMENTS MFG. CO.

6645 S. Narragansett Ave., Chicago 38, Ill.

SINCE 1910

INDUSTRIAL PRODUCTS DIVISION

Richard S. Stonage has been appointed product manager for welding wire and stainless wire, Page Steel & Wire Division, American Chain & Cable Co., Inc., Monessen, Pa. He succeeds *V. H. Godfrey*, who has retired.

Preston L. Scott is the new district sales manager of the southeastern states for Hobart Brothers Co., Troy, Ohio. He will supervise distribution of arc-welding equipment and electrodes in North and South Carolina, Georgia, Florida and part of Tennessee.

William J. Miller has been named manager of sales and production for the Bias Buff Division, Riegel Textile Corp., Conover, N. C. The buff production facilities were recently transferred to Conover from Jersey City.

Precision Welder & Flexopress (Canada) Ltd., Toronto, recently named *William Amos* manager of engineering and sales, and *Albert Moore* manager of manufacturing for its newly completed Toronto plant.

Harnischfeger Corp., Milwaukee, has appointed three welder sales representatives to its Pittsburgh office: *E. W. Brueckner*, *J. T. Hetherington*, and *L. R. Robinson, Jr.* All will have territories which include sections of Pittsburgh.

R. H. Binkerd was recently named general sales manager of NRC Equipment Corp., Newton, Mass. He will have full responsibility for formulating over-all sales policies and for supervising activities of the company's field staff and distributors.

Died . . .

John B. Tinnon, retired vice president in charge of sales for Metal & Thermit Corp., New York City, died Nov. 30 at the age of 74. He joined M & T in 1924, was elected vice president in 1944 and retired in 1955. Surviving are his widow, three sons and two sisters.

William J. Hutchinson, 75, died Nov. 25 after an illness of several months. He was a director and former treasurer of the International Nickel Co. of Canada, Ltd.

Harold W. Robbins, 77, died Oct. 13. at Tustin, Calif. He was a former member of the AWS.

NOW—find the answers to your WELDING PROBLEMS *faster!*

Here, complete in one volume, are all welding fundamentals and practical working techniques — arranged alphabetically for speedy reference.

THE WELDING ENCYCLOPEDIA

Edited by T. B. Jefferson, Editor and Publisher, *Welding Engineer*. 13th Ed., 1008 pp., over 1400 illus., $7.50.

The working guide for all welding applications in all industries is a must for engineers, designers, supervisors, foremen, and weldors. Over 2000 subjects—in alphabetical order and cross reference throughout—put the facts you want at your fingertips. It covers all phases of welding, cutting, flame treating, etc., as well as problems of production, repair, and maintenance. Handy tables and charts . . . dictionary of trade names . . . buyers' manual—all go to make this a vital guide wherever welding is used.

MORE THAN 2000 SUBJECTS

INCLUDING—

arc welding
gas welding
cast iron
flame cutting
flame hardening
heat treatment
inert gas shielding
oxyacetylene
pipe welding
resistance welding
submerged arc welding
training weldors
welding cleaning
welding symbols

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THE WELDING ENCYCLOPEDIA
P.O. Box 28, Morton Grove, Ill.

Please send me_____copies of the 13th Edition of The Welding Encyclopedia. I enclose ☐ check ☐ money order ☐ Bill me.

Name_____

Address_____

City_____ Zone____ State_____

Company_____

Title_____

When You Weld Cast Iron
Select the Correct

Fuse-Well

CAST IRON WELDING RODS
OR ELECTRODES

FUSE-WELL NO. 11

FUSE-WELL No. 11, Square—Gray Cast Iron Welding Rod for Acetylene use in filling or building up new or worn castings producing machineable welds.

FUSE-WELL NO. 12

FUSE-WELL No. 12, *Round*—Has the same uses and analytical ingredients as Fuse-Well No. 11.

FUSE-WELL NO. 14 MOLY

FUSE-WELL No. 14, *Moly*—An Iron Base Rod with alloys added for finer grain structure and greater strength.

FUSE-WELL NO. 22

FUSE-WELL No. 22, *Electrode* — Light coated Rod to be used for AC or DC welding in the fabricating and repairing of cast iron castings.

THE CHICAGO HARDWARE FOUNDRY CO.
Weld Rod Division
NORTH CHICAGO, ILLINOIS

Flood Flame FINEST QUALITY FAIRLY PRICED

FIBER GLASS
HELMETS

Seamless and stoutly reinforced with more comfortable and durable Fit-Rite, snap-on ratchet type headgear.

No. 51-8F-2H

NEW DESIGN
ADVANTAGES

1. Lighter weight.
2. Smoother, easier to clean.
3. Moisture-proof, non-warping.
4. Superior resistance to heat.
5. Easily sterilized.

These and other advantages give you better protection, comfort and ECONOMY.

No. 51-2F-2H

INSTANT
HEAD SIZE
ADJUSTMENT

Enjoy real savings with Flood's
1000-HOUR COVER LENSES
Flood manufactures a complete line of welding and safety equipment . . . if you have a problem feel free to call upon us.

AT YOUR DISTRIBUTOR OR WRITE:

FLOOD SAFETY PRODUCTS CO.
3035 West Lake Street, Chicago 12, Illinois

30 YEARS AGO

(Taken from the WELDING ENGINEER *of January, 1930)*

— 30 YEARS AGO —

W. H. Loveman, president of The Burdett Oxygen Co., Cleveland, has announced that his firm is planning the construction of a $200,000 addition to its plant at 3100 Lakeside Ave., NE.

— 30 YEARS AGO —

Among the papers presented this month at the mid-winter meeting of the Gas Products Association in Chicago were "Suggested activities of the Association," by A. J. Fausek, president of Modern Engineering Co.; "The other eighty percent," by H. S. Card, editor of WELDING ENGINEER.

— 30 YEARS AGO —

Welding speeds attainable by use of a new method of handling the electrode, known as the "whip" technique, are startling to those who are not familiar with the method, according to Arthur Bernard.

— 30 YEARS AGO —

A. H. Friese, president of Welding Engineering Co., Milwaukee, is greatly pleased with his firm's welding shop on wheels. The demonstration vehicle is a Hudson automobile with a special body arrangement for mounting arc and gas welding equipment.

— 30 YEARS AGO —

C. J. Holslag, chief engineer for Electric Arc Cutting & Welding Co., Newark, writes that his firm has acquired additional space adjoining the plant at 152 Jelliff Ave. to accommodate the wire department.

— 30 YEARS AGO —

J. R. Van Rensselaer, formerly sales representative with Taylor-Wharton Iron & Steel Co.'s San Francisco distributor, is now located at the New York cylinder sales office of William Wharton, Jr., & Co.

— 30 YEARS AGO —

A group of arc-welding-machine manufacturers is sponsoring a series of advertisements appearing in magazines with large industrial circulation. Aimed at promoting arc welding, the ads are signed by General Electric Co., Lincoln Electric Co., Westinghouse Electric & Mfg. Co., Northwestern Mfg. Co., Una Welding & Bonding Co. and Wilson Welding & Metals Co.

TILLMAN
Gloves—Garments

BUY
FROM YOUR
DEALER

GLOVES
MITTENS
GARMENTS

NOW
PACKAGED
IN
POLY BAGS

BRAZILIAN DEERSKIN
THE "STAY SOFT" LEATHER
GLOVES AND MITTENS

TILLMAN PRODUCTS
John Tillman & Co.
Long Beach, Calif.

IN 1936, MORT CLARK, then Vice-President of the world's largest sign manufacturer, wanted a welded galvanized sign frame. Every welder manufacturer said it couldn't be done . . . Mort Clark did it, received a check and certificate of achievement from the Lincoln Welding Foundation—and

MORT CLARK'S GALV-WELD ALLOY ORIGINAL & GENUINE

WAS BORN

The Navy didn't believe, tested it 3384 hours in salt spray (100 hours is normal), then approved it. Westinghouse reports Galv-Weld roof sign, installed 1936—still perfect in 1959—23 YEARS LATER!

TIME PROVEN - MODESTLY PRICED
WHY EXPERIMENT?

Regalvanizes corrosive seams and areas where galvanizing is burned away by welding, skipped in hot dip galvanizing, or abraded in fabrication.

Eliminates corrosion areas produced by welding, so that weld will stand up under paint, WITHOUT rust, as on ornamental iron. Simply use residual heat from welding, or reheat, wire brush, and apply. No fluxing—No fumes.

Makes every welder a galvanizer of small weldments or parts. Repairs chipped porcelain, rusted appliances, rusted auto, truck or trailer bodies, frames, fenders, or other steel products. Can be readily refinished to match surrounding surface.

Ideal for pipe joints, galvanized structures, water and fuel tanks, duct systems, cold storage lockers, sinks, drains, washers, towers, steel buildings, railings, etc.

Some distributor franchises still available. Cash in on consistent campaign now running in 18 national magazines.

—Mail Coupon Today—

GALV-WELD PRODUCTS
Dept. WE — Box 1303 — Bradenton, Fla.
Send Information User ☐ Distributor ☐
Dealer ☐ Free Sample ☐
Name..... Address.....
City..... State.....

free literature . . . . . use card on page 81

75. WELDING HELMET—Sellstrom Mfg. Co. Four page illustrated catalog describes new nylon lift-front and stationary plate retainers and new ratchet headgear.

76. CONNECTION MAINTENANCE—Tweco Products, Inc. Bulletin CC-59 contains information on how to maintain welding equipment and electrical connections.

77. WELDING EQUIPMENT—Linde Co. Heliarc (Tig) line of manual welding equipment fully covered in 20-page catalog F-8982E.

78. METAL CORROSION—Corrosion Reaction Consultants, Inc. Simple, economical way to prevent metal corrosion is discussed in 8-page catalog.

79. ACETYLENE GENERATOR—The Sight Feed Generator Co. Model ATX acetylene generator described in new four-page brochure.

80. SOLDERING SUPPLIES—Johnson Mfg Co., Inc. Catalog C-1 contains complete descriptions of fluxes, solders and supplies for all soldering applications.

81. GAS WELDING RODS—Page Steel & Wire Div. Bulletin DH-1277-B gives complete information about manufacturer's gas welding rods, including analysis, recommended uses, welding procedure, and physical properties.

82. STEEL ELECTRODES—Harnischfeger Corp. Bulletin R-49 gives full specifications on extended line of stainles steel electrodes covering all AWS-ASTM types.

83. AIR CYLINDERS. Fabco. Sheet tells of Pancake line of compact cylinders designed to keep tooling small.

84. ELECTRON BEAM WELDER—Nuclear Metallurgical Enterprises, Inc. Brochure describes new portable vacuum welder.

85. METALLURGY GUIDE—Tempil Corp. Copy of basic guide to ferrous metallurgy in convenient size for engineers' data books.

87. SNAGGING WHEELS—Cincinnati Milling and Grinding Machines, Inc. General catalog PG-356 describes the features and proper selection of snagging wheels.

88. SAFETY GLASSES—Bausch & Lomb Optical Co. 40-page catalog A-1762, lists complete line of safety products including glasses, goggles, and lenses.

89. CUTTING APPARATUS—Chemetron Corp. Individual items and welding, cutting or combination outfits described in 16-page catalog NR-175.

90. RELIABILITY TESTS—Magnaflux Corp. Booklet briefly describes wide range of reliability tests available.

91. ARC WELDERS—Hobart Bros. Co. All welding machines are described in new 24-page catalog. Includes complete information on rectifier, transformer, and combination type welders, as well as a-c and d-c units.

92. ELECTRONIC TRACER—Linde Co. Booklet 1287 illustrates how built-in automatic kerf compensator makes possible reproduction of complicated metal parts with extreme accuracy.

93. C-CLAMPS—Wilton Tool Mfg. Co., Inc. Details of construction and general description of C-clamps are given in 4-page illustrated condensed catalog.

94. GAS REGULATORS—Beam Products, Mfg. Co. New brochure describes complete line of LP-gas and natural regulators. Horsepower ranges from 2 to 500 with detailed specifications and applications are illustrated.

95. SAFETY PAMPHLETS—National Safety Council. Two pamphlets deal with home and industrial fires.

96. INDUCTION HEATING — Induction Heating Corp. 52-page catalog contains recent developments in hardening, brazing, soldering, forging and annealing by company equipment.

97. VACUUM EQUIPMENT—NRC Equipment Corp. Product summary classifies vacuum equipment and components by type and code number.

98. HOSE ACCESSORIES—Le-Hi Div. of Hose Accessories Co. Hose couplings, clamps, valves and manifolds, nipples and hydraulic assemblies are covered in pamphlet.

99. INDUSTRIAL ISOTOPES. Picker X-Ray Corp. Bulletin No. D1759, "Industrial radiography with radioisotopes," describes equipment and methods of radiography of all kinds of industrial products.

100. TORCHES. Insto-Gas Corp. Company's line of welding torches is detailed in booklet.

101. ELECTRODE PRESSURE GAGE. Instrument Control Co. Flyer tells of gage for measuring welding electrode pressure with only 5/8 in. between load points.

102. ULTRASONIC CLEANING. Oakite Products Inc. Service bulletin 16A tells how to get the most out of ultrasonic cleaning in industrial operations.

103. HOLDERS. Lenco Inc. Booklet describes Hi-Amp electrode holders, cable attachments and ground clamps. All products are illustrated.

104. TUBING. The Babcock & Wilcox Co. Carbon steel tubing, seamless or welded for pressure uses, is detailed in technical data card 142B. Mechanical properties and welding data are included.

105. HARDFACING. American Brake Shoe Co. Amsco 53, a manual electrode for general purpose hardfacing for impact and abrasive wear is covered in data sheet.

106. LAMINATING RESINS. Furane Plastics Inc. Brochure is concerned with Epocast laminating resins, their applications as welding jigs and fixtures, and their typical physical properties.

107. CERAMIC TOOL COMPONENTS—Duramic Products, Inc. High temperature ceramic tool components, including bushings, washers, discs, plates, rods and V-blocks, are listed in Bulletin 116.

108. VINYL COATED STEEL. U. S. Steel Co. Products 8 is a folder illustrating products made from firm's line of vinyl coated steel sheet.

109. ELECTRODE HOLDERS. Jackson Products. Form 10-ST details new electrode holder with mechanical cable connection and tongs of heat-treated 98% copper alloy.

110. CEILING OUTLETS. National Cylinder Gas. Hose reel ceiling outlets for operating and recovery rooms are described and illustrated in bulletin NM-188.

111. PNEUMATIC VALVES—Ross Operating Valve Co. Condensed catalog contains installation and maintenance information, as well as dimensional and parts data, on pneumatic valves.

112. TEMPERATURE INDICATORS. Tempil Corp. Catalog 5905 covers temperature indicating crayon for 2300, 2400 and 2500 F.

113. WELDING SHIELDS. Diamonite Products Mfg. Co. Booklet WC-859 covers line of welding cups, nozzles and shields made from high aluminum ceramics.

114. CYLINDER CAPS. Pressed Steel Co. Drawn seamless steel cylinder caps and neck rings are illustrated in flyer. Specifications are included.

115. STEEL ELECTRODES. A. O. Smith Corp. Bulletin MW-178 discusses welding steels and electrodes. It includes composition and comparisons.

116. MANGANESE BRONZE. Ampco Metal Inc. Ampcoloy 666, a new extruded manganese-bronze alloy, is described in data sheet G53.

117. MAGNETIC SEPARATOR. Techline Div., Wheelabrator Corp. Bulletin 402 details unit which separates ferrous parts from media and provides answer for parts which make media selection difficult.

118. SWIVEL VISE. Wilton Tool Mfg. Co., Inc. Swivel jaw vice with tapered lock pin is described in booklet.

121. VALVES. Hannifin Co. Revised valve finder includes minimum and maximum capacity coefficients for line of directional air control valves.

122. WELDING IN USE. Taylor-Winfield Corp. "Weld-It No. 592" discusses uses of company welders in production of Watt-Hour meters.

125. ULTRASONIC CLEANER. Princeton Div., Curtiss-Wright Corp. Curtisonic Model 500 is a five gal capacity unit for cleaning and is described on flyer ISP 28-7.5.

126. CONVEYOR BELT—Raybestos-Manhattan Inc. Brochure M302 graphically describes features of Ray-Man conveyor belt. It is claimed no breaker fabric is needed with this belt.

127. BRAZING ALLOYS—Western Gold & Platinum Co. Catalog V-124 gives characteristics of complete line of low vapor pressure, precious metal brazing alloys for vacuum systems.

130. LABORATORY OVEN — Hevi-Duty Electric Co. Bulletin 458 pictures and describes Model HK heavy duty oven capable of temperatures to 482 F. It operates on 115 or 230 volts.

131. HAND TORCHES—Selas Corp. of America. Bulletin HT-1 presents line of gas-fired, spear flame torches in five standard sizes. Useful in many heating operations up to 2,000 F.

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CUTTING TORCHES, Used, Oxweld, Airco, Harris.
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RALL SUPPLY CO. 51 E. 42nd St., N.Y.C. 17

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One move on simple slide rule figures length of run and angle of cut for dog legs, braces, trusses etc. Post paid $3.50 each.

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Reconditioned G. E. Atomic Hydrogen Welding Machine
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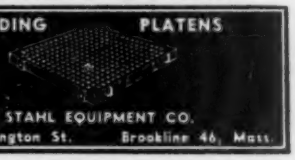

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All Material Unconditionally Guaranteed

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BAldwin 8-2372, Phila. 40, Pa.

Literature offered in ads

150. Acro Welder Mfg. Co.—Write for further information on welding machinery engineered and manufactured to order.

151. Air Reduction Sales Co.—Further information available on five "Airco Heliweld Holders," to reduce electrode loss.

152. Alloy Rods Co.—Bulletin HS-102 on the "Wear-O-Matic" process is available.

153. All-State Welding Alloys Co., Inc.—Instruction manual available and information on custom coating your welding rods.

154. American Brass Co.—Write for publication B-13, explaining "Everdur" welding rods.

155. American Optical Co.—Further information on the "Vinylite mask goggle" and the "Duraweld goggle" manufactured by American Optical.

156. Ampco Metal, Inc.—Bulletin available on the new Ampco cable connector.

157. Ansco, Div. of General Aniline & Film Corp.—Write for further information on Ansco films.

158. Atlas Welding Accessories Inc.—Further information available on Atlas "Wide Blade" chipping tools.

159. Bateman Foundry & Machine—Complete information on the "Bantam Iron Worker" and name of your nearest distributor is available.

160. Bernard Welding Equipment Co.—Further information available on Bernard water coolers.

161. Budd Co.—Complete details on the "Monautronic" resistance welding control.

162. Budd Co.—Gamma Radiography bulletins available.

163. Chicago Hardware Foundry Co.—Information on "Fuse-Well' cast-iron welding rods and electrodes is available.

164. Clements Mfg. Co.—Bulletins on "Clements Cadillac Model K Blowtorch."

165. Contour Sales Corp.—Data available on "Curv-O-Mark" pipe-layout tools for marking pipes and structural angle cuts of any type.

166. Drawalloy Corp.—For complete information on every grade of Drawalloy wire, write for bulletin 355 DC.

167. Eutectic Welding Alloys Corp.—Further information available on Eutectic "Low Temperature Welding Alloys."

168. Fibre-Metal Products Co.—Catalog No. 26 describes "Fiberglas" welding helmets.

169. Flood Safety Products Co.—Information available on fiber glass helmets and other welding and safety equipment.

170. Galv-Weld Products—Information and distributor franchises on galvanized welding and samples, are available.

171. Goldsmith Brothers, Div. of National Lead Co.—Data book on silver brazing alloys available.

172. Harnischfeger Corp.—Write for Bulletin R-49 which gives the chemical range and mechanical properties of each P&H stainless steel electrode.

173. Harnischfeger Corp.—Bulletin W-158 further explains the P&H engine-driven welders and Bulletin R-27 gives further information on hardsurfacing electrodes.

174. Hobart Brothers Co.—Further information on the new "Auto-Flux H-400" for submerged arc welding.

175. Hobart Brothers Co.—Further information available on automatic welding for submerged arc and CO_2 welding and "Manumatic" and "Migarc" welding.

176. Independent Engineering Co.—Information available on acetylene cylinders manufactured by Independent.

177. International Nickel Co. — Booklet, "Now You Can Weld Dissimilar Alloys Quickly and Easily" includes actual cases of problem welds solved with Inco-weld "A" electrode and wire.

178 Jackson Products—Further information available on Jackson's new "Sealed Tight" electrode holders.

179 Lenco, Inc.—Information on "Hi-Amp" electrode holders available.

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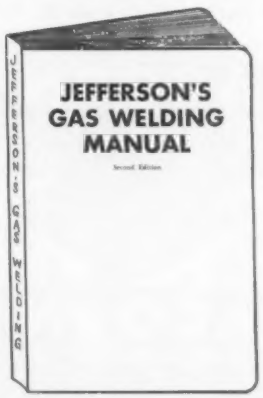

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USE THIS CARD for Literature, Catalogs, and Bulletins shown on preceding pages and for those featured in this month's ads as listed opposite and on following page

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Every month WELDING ENGINEER lists many new catalogs and bulletins available from manufacturers. All are yours for the asking. However, this service is valuable to you only if you use it.

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★ For additional information on New Products described in this issue, circle the numbers of the items that interest you. The New Products section begins on page 64.

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Literature offered in ads . . . continued

180. Lincoln Electric Co.—Further information on "Jetweld" low-hydrogen electrodes.

181. Linde Co.—Write for further information on Linde's "Mighty Midget" welder.

182. Liquid Carbonic Div., General Dynamics Corp.—Write for illustrated literature on "Liquidweld" apparatus.

183. Maitlen & Benson, Inc.—Information on "Wypo" cutting and welding tip cleaners.

184. Manhattan Rubber Div.—Further information available on "Manhattan Moldisc" for grinding or removal of metal.

185. Markal Co.—Literature and pellet samples of "Thermomelt" temperature indicators available.

186. Merrill Brothers—Write for further information on Merrill's material handling devices.

187. Metal & Thermit Corp.—Further information available on M&T "Murex" electrodes and their complete line of welding machines.

188. Miller Electric Mfg. Co., Inc.—Complete specifications on the Gold Star welders available.

189. National Carbide Co.—Additional information available on calcium carbide and name of your nearest distributor.

190. Page Steel & Wire Div.—Folders available on Page welding wire.

191. J. M. Ragle Industries Inc.—Additional information available on "Commando" rods, and other "Commando" products.

192. Rankin Mfg. Co.—Write for data on "Ranite" hardsurfacing rods.

193. Ransome Co.—Write for additional information on Ransome welding equipment.

194. Riegel Textile Corp.—Catalog available on Riegel gloves.

195. Singer Glove Mfg. Co.—Catalog available showing the new portable screen for protection on all four sides for complete enclosure of weldor.

196. Stoody Co.—Complete information on Iron Powder Coating, for build-up of metal parts.

197. Sylvania Electric Products Inc.—Write for further information on Tungsten electrodes manufactured by Sylvania for "TIG" welding.

198. Syntron Rectifier Div., Syntron Co.—Information and specifications available on Syntron selenium welding stacks.

199. Tempil Corp.—Sample Tempil pellets available and information on Tempilstiks.

200. Tennessee Fabricating Co.—Catalog on casting designs, welding rods, tubing and machine tools and supplies are available.

201. Thermacote Company—Samples available of "Thermo Sta-Kleer" cover lens and literature.

202. John Tillman & Co.—Catalog available on weldor's gloves and garments.

203. Tuffaloy Dept. Air Reduction Sales Co.—Catalog and price list on Tuffaloy "Cold-Formed Tips."

204. United Specialties, Inc.—Brochure available on automatic hose and cable reels.

205. Victor Equipment Co.—Bulletin 353 available describing how you can speed your production with Victor Cutting Machines, also dealerships available.

206. Welsh Mfg. Co.—Write for further information on Welsh's new goggles for weldors.

207. Hayes Stellite Co.—Booklet available, "Hayes Alloys Hard-Facing" manual.

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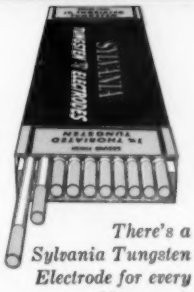
makes pipe dreams come true

Whether you're welding a transcontinental pipeline, nuclear steam-supply valves, or the hardware for outer space, you'll find Tungsten Inert Gas Welding offers many important advantages. And for the finest there is in Tungsten Electrodes, you want Sylvania.

Sylvania offers the most complete line of top-quality Tungsten Electrodes: Puretung®, Zirtung®, 1% Thoriated, 2% Thoriated. Each comes in the preferred finish—cleaned or ground, and color-coded to save time, and prevent costly errors. Chemical & Metallurgical Division, Sylvania Electric Products Inc., Towanda, Pennsylvania.



There's a Sylvania Tungsten Electrode for every welding need.

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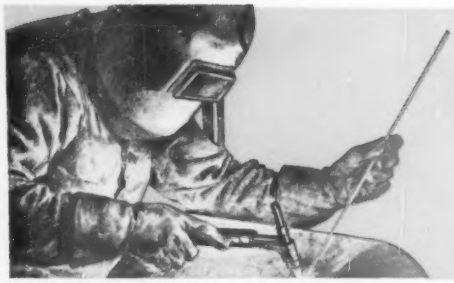
Subsidiary of **GENERAL TELEPHONE & ELECTRONICS**



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The American Brass Company, Waterbury, Conn.

EVERDUR® ROD SPEEDS WELDING OF GALVANIZED STEEL

Arc welding is usually the most expedient means of reducing distortion, the major source of trouble in welding light-gage metal. However, metal-arc welding with covered electrodes adds more problems than it solves, due to difficult control and the need to remove slag and spatter from the product. Such difficulties are frequently encountered in steel sheet metal work.

In contrast, carbon-arc and inert-gas tungsten-arc welding offer easy control and eliminate slag and spatter. When these processes are used with a copper-alloy filler rod, such as Everdur-1010, control is greatly improved because Everdur's lower melting point produces bonding with only minimum melting of the steel. Increased welding speeds and the narrow heat-affected zones mean reduced distortion. Joint properties are adequate for all but the most exacting applications.

The narrow heat-affected zones make these processes attractive also for welding galvanized steel because they cause the least possible disruption of the protective zinc coating. With nonrusting copper-alloy welding rods they make the most dependable joints possible. So, Everdur-1010 has become a favorite filler metal for use with these processes in the fabrication of galvanized structural elements, ducts, and various types of container.

WELDING AIR-CONDITIONING DUCT SYSTEM FITTINGS at Carrier Corporation's plant in Philadelphia, using the carbon-arc process, with Everdur-1010 Welding Rod.

Carrier Corporation is one of the many concerns that utilize these advantages in their manufacturing operations. For many years, fittings and other components of their air-conditioning duct systems have been produced with ease and economy by welding with the carbon arc and Everdur-1010 Welding Rod.

Best results in welding either plain or galvanized steel require that only the least possible amount of steel be melted. To insure this it is necessary to avoid weaving so as to keep the arc always on the bronze weld metal. Arc lengths are kept as short as possible and current values set low enough to require welding speeds that can be handled with ease.

Joint types usually employed in sheet metal work—square butt, lapped, edge, and corner welds—are suitable for use with these processes.

Free Technical Service. If you have questions regarding the possible application of these processes to your job, Anaconda specialists will gladly help with suggestions. For such help or a copy of Publication B-13 write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

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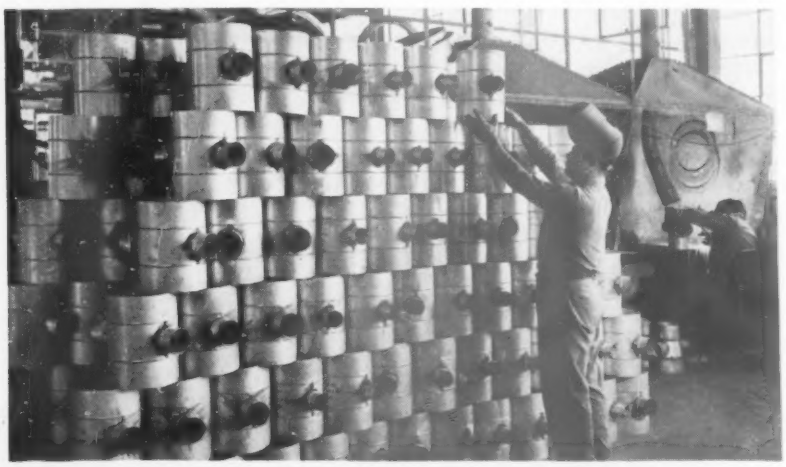

ANOTHER VIEW OF AREA devoted to welding Carrier duct system components.

ANACONDA®
WELDING RODS
made by
The American Brass Company